UltraCW™

Automatic Cell Washing System
Operation Manual

UltraCW™ **Version B**

Model UltraCW™

S/N _____

HELMER, INC. 14395 BERGEN BLVD., NOBLESVILLE, IN 46060 USA
PHONE (317) 773-9073 FAX (317) 773-9082
USA and CANADA (800) 743-5637
www.helmerinc.com

360084-1/H

Contents

About this manual iv

1 Working safely 1
1.1 General safety 1
1.2 Electrical safety 1
1.3 Chemical and biological safety 2

2 Touring the cell washer 3
2.1 Touring the front, lid, and bowl 3
2.2 Touring the side 4
2.3 Touring the rear 4
2.4 Touring the control panel 5
2.5 Touring the rotor 6

3 Installing the cell washer. 7
3.1 Recording identification information 7
3.2 Selecting an appropriate location 7
3.3 Powering the cell washer 8
3.3.1 Installing the power cord 8
3.3.2 Connecting to power 8
3.3.3 Turning the power on and off 8
3.4 Opening and closing the lid 9
3.5 Removing packaging materials 9
3.6 Removing the transport bolts 10
3.7 Connecting to the saline supply and drain 11
3.7.1 Installing and removing the supply and drain tubing 11
3.7.2 Connecting to the saline supply 12
3.7.3 Connecting to the drain 12

4 Programming the cell washer 13
4.1 Understanding processes and process steps 13
4.1.1 Understanding processes 13
4.1.2 Understanding process steps 13
4.2 Understanding programs and parameters 16
4.2.1 Understanding global parameters 16
4.2.2 Understanding programs and program parameters 18
4.3 Viewing and changing global parameters 20
4.3.1 Returning to display mode 20
4.3.2 Viewing global parameters 20
4.3.3 Changing global parameters 21
4.4 Working with programs and program parameters 21
4.4.1 Selecting a program 21
4.4.2 Viewing program parameters 22
4.4.3 Changing program parameters 23

5 Using the cell washer 24
5.1 Preparing the rotor 24
5.1.1 Installing and removing the rotor 24
5.1.2 Installing and removing the tube holder inserts 25
5.1.3 Selecting the rotor type 25
5.1.4 Confirming that the rotor is balanced 26
5.1.5 Loading tubes 26
5.2 Calibrating the saline volume 27
5.2.1 Determining the saline volume to dispense into each tube 27
5.2.2 Dispensing and measuring the total saline volume 28
5.2.3 Determining how much to adjust the volume 29
5.2.4 Adjusting the saline volume 29
5.3 Starting and stopping processes 30
5.3.1 Starting a process 30
5.3.2 Pausing and resuming a wash process 31
5.3.3 Stopping a process 31
5.4 Controlling audible alerts for process completion 31

6 Maintaining the cell washer 32
6.1 Reviewing the preventive maintenance schedule 32
6.2 Cleaning the cell washer 33
6.2.1 Cleaning the exterior 33
6.2.2 Cleaning the interior 33
6.2.3 Flushing the system 35
6.2.4 Cleaning the fill ports 37
6.3 Replacing the pump tubing 38
6.4 Replacing tube holders 40

7 Understanding and addressing operational issues 41
7.1 Understanding and addressing error messages 41
7.2 Addressing performance problems 44
7.3 Addressing equipment problems 45
7.4 Releasing the lid lock 46

8 Reference information 47
8.1 Technical Specifications 47
8.1.1 Power 47
8.1.2 Weight 47
8.1.3 Size 47
8.1.4 Other specifications 47
8.1.5 Operating conditions 47
8.1.6 Energy conservation and regulatory compliance 47
8.1.7 Supplies 48
8.2 Sample programs 49
8.2.1 Sample single-cycle washing process 49
8.2.2 Sample multiple-cycle washing process 50
8.2.3 Sample suspension-only process 51
8.2.4 Sample suspension with agitation process 52
8.2.5 Sample spinning-only process 53
8.2.6 Sample spinning with decanting process 54
8.2.7 Sample spinning after agitation process 55
8.2.8 Sample agitation-only processes 56

Warranty 58

About this manual

Welcome to the UltraCW™ Automatic Cell Washing System Operation Manual.

This section explains the symbols and conventions used in this manual, copyright information about this document, and trademark information for products supplied by Helmer.

Symbols and conventions

Several symbols and conventions are used in this manual.

Warnings

A Warning is used to call attention to a condition or possible situation that could cause injury to the operator.

Warnings are identified as follows:

WARNING: This is a sample of a warning: Follow all chemical handling and disposal requirements and procedures specified by your organization.

Cautions

A Caution is used to call attention to a condition or possible situation that could damage or destroy the equipment or the operator's work.

Cautions are identified as follows:

CAUTION: This is a sample of a caution: Be sure the tubing is free of obstructions. Blocked tubing can cause fluid to back up and cause motor failure.

Notes

Notes contain additional information about a topic. Notes are used to provide information about how a topic relates to another topic, or background information about a design characteristic.

Notes are identified as follows:

NOTE: This is a sample of a note: Tubing kits are available for purchase through Helmer.

Model references

Generic references are used throughout this manual to group models that contain similar features. For example, "UltraCW" refers to both the 115 V and 230 V models. If a feature or procedure applies to a specific voltage, it is stated as such.

Copyright and trademark information

Copyright © 2008 Helmer, Inc.

UltraCW™ is a registered trademark of Helmer, Inc. in the United States of America.

All other trademarks and registered trademarks are the property of their respective owners.

1 Working safely

This section describes general safety information for installing, using, and maintaining the UltraCW Automatic Cell Washing System (“cell washer”). Your organization may provide additional safety information.

1.1 General safety

To avoid injury to yourself and the cell washer, follow these safety instructions:

- Use the cell washer for the purpose for which it was designed. Avoid using the cell washer to process materials that are flammable, explosive, highly corrosive, or materials that produce high levels of energy when they react with one another.
- Do not use the cell washer if its components are damaged. Notify the appropriate personnel in your organization for guidance regarding usage and maintenance.
- Never attempt to physically restrict any of the moving components.
- Do not move or bump the cell washer during operation.
- Before performing the procedures in this manual, review the specific safety instructions for them.
- Perform only the maintenance described in this manual. Maintenance other than that specified in this manual should only be performed by technical service representatives authorized by Helmer.

1.2 Electrical safety

WARNING: The cell washer has the potential of being a shock hazard. Review all safety instructions.

Review the following safety instructions before installing, using, or maintaining the cell washer:

- Inspect all electrical equipment and address any problems prior to installation.
- Avoid removing covers from the cell washer unless instructed to do so.
- Use only the power cords supplied with the cell washer.

1.3 Chemical and biological safety

Review the following safety instructions before installing, using, or maintaining the cell washer:

- Only use cleansers and disinfectants with a pH of 5 to 8.
- Do not use an autoclave to clean any components of the cell washer.

WARNING: In addition to the instructions included in this manual, follow all chemical handling and disposal requirements and procedures specified by your organization.

Chemical handling and disposal requirements for your organization may include the following:

- Use of appropriate protective equipment when cleaning the cell washer
- Use of specific cleansers and cleaning supplies
- Appropriate handling and disposal of materials that are infectious, toxic, pathological, radioactive, or otherwise biologically or environmentally harmful
- Notification of appropriate chemical and biological safety personnel when handling or disposing of materials that are infectious, toxic, pathological, radioactive, or otherwise biologically or environmentally harmful

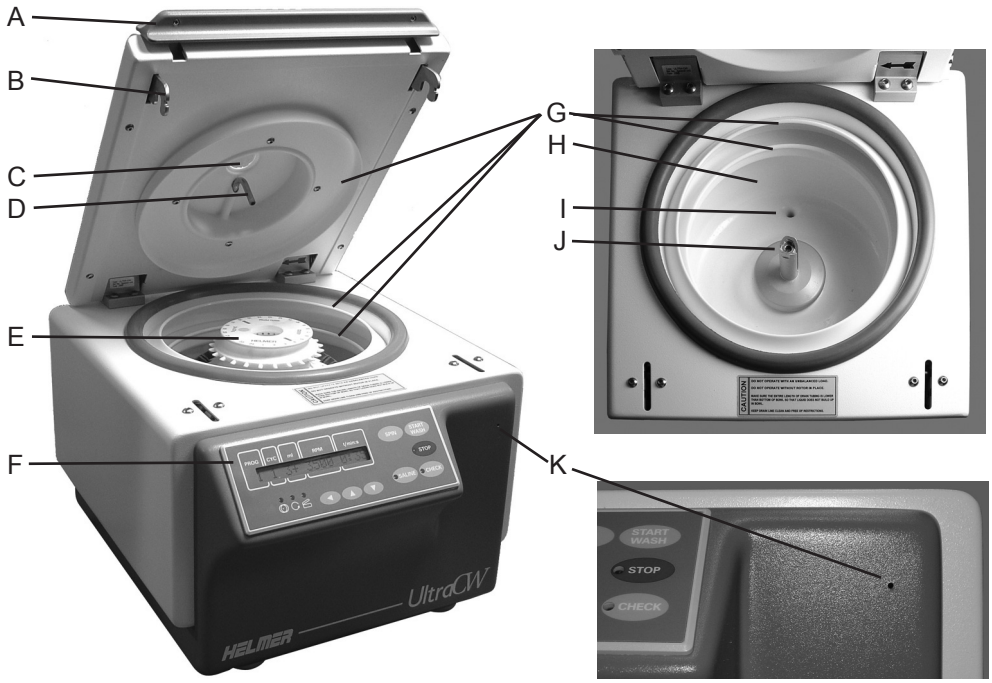
WARNING: Before sending parts to Helmer or your distributor for service or repair, decontaminate them as appropriate. Any items that have not been decontaminated appropriately will not be accepted. Documentation stating that the contents are not contaminated and are safe to handle must accompany all returns. Contact Helmer or your distributor for decontamination instructions and a return authorization number.

2 Touring the cell washer

Congratulations on your purchase of an UltraCW Automatic Cell Washing System. The cell washer provides advanced capabilities and outstanding benefits to complete your cell washing tasks quickly, easily, and dependably.

This section gives a brief overview of the components of the cell washer, as well as how to find identifying information. Note that some components vary by options selected at the time of purchase.

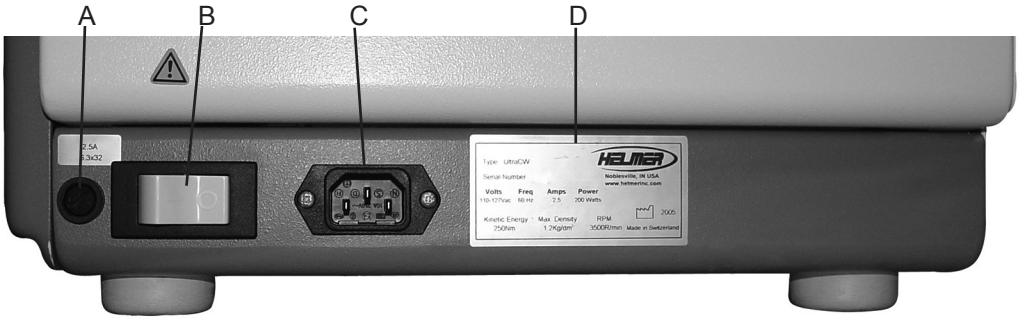
2.1 Touring the front, lid, and bowl



Left: Front of cell washer with lid open and rotor installed. Right top: Bowl with rotor removed. Right bottom: Access hole

Label	Description	Function
A	Lid handle	Releases the lid lock and opens the lid
B	Latch	Latches the lid in the closed position
C	Sight window	Provides visual access to the cell washer during operation. Used for measuring rotor speed.
D	Nozzle	Directs the saline wash solution into the rotor
E	Rotor	Holds the tubes
F	Control panel	Controls and displays the status of the cell washer
G	Drainage system	Contains the liquid used during processing
H	Bowl	Contains the liquid used during processing
I	Drain	Drains waste fluid from the bowl
J	Rotor shaft	Spins the rotor
K	Access hole	Provides access to the lid lock

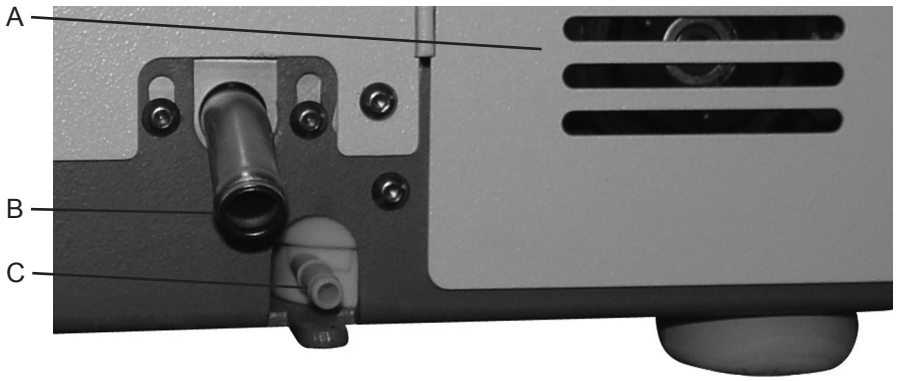
2.2 Touring the side



View of right side of cell washer

Label	Description	Function
A	Fuse	Prevents current overload
B	Power switch	Turns the cell washer on and off
C	Power connector	Interface for the power cord
D	Product Specification label	Provides the model number, serial number, and electrical requirements for the cell washer

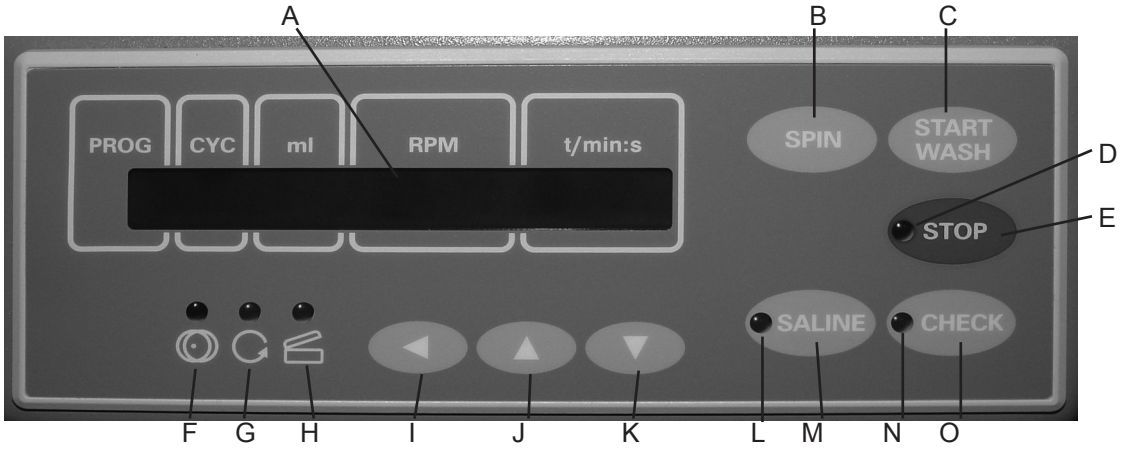
2.3 Touring the rear



View of rear of cell washer

Label	Description	Function
A	Access door	Provides access to the pump and pump tubing
B	Drain connector	Drains saline solution from the cell washer
C	Supply connector	Supplies saline solution to the cell washer

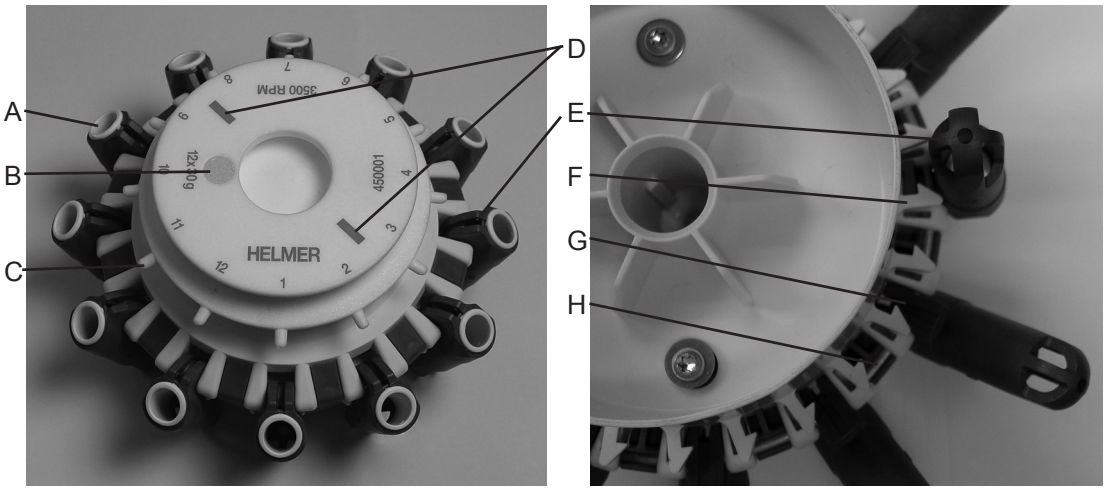
2.4 Touring the control panel



Control panel (shown with cell washer turned off)

Label	Description	Function
A	Message screen	Displays process information, programming prompts, and error messages
B	SPIN button	In display mode: Starts the process that uses the spinning group of parameters of the selected program
C	START WASH button	In display mode: Starts the process that uses the washing group of parameters of the selected program In programming mode: Saves any changes being made to values in the current parameter menu
D	Stop lamp	Indicates when the rotor is moving after a process has been paused or stopped
E	STOP button	In processing mode: Stops the current process In programming mode: Cancels any changes being made to values in the current parameter menu In calibration mode: Stops the flow of saline solution
F	Imbalance lamp	Indicates when the rotor is not balanced
G	Spin lamp	Indicates when the rotor is moving
H	Lid Ready lamp	Indicates when the lid is ready to be opened
I	Parameter selection button	In display mode: Enters programming mode In programming mode: Selects a parameter
J, K	Parameter value buttons	In programming mode: Increases or decreases the value for the selected parameter. Also toggles between the Shakings and ShakeT(min) global parameters In display mode: Selects a program
L	Saline lamp	Indicates when saline solution is being dispensed
M	SALINE button	In display mode: Enters calibration mode In processing mode: Starts the Refill sequence of the cleaning program
N	Check lamp	Indicates when a process has been paused
O	CHECK button	In processing mode: Pauses the process if it was started using the START WASH button In calibration mode: Starts the flow of saline solution

2.5 Touring the rotor



Left: Top view of 12-place rotor with inserts installed. Right: Bottom view of 12-place rotor

Label	Description	Function
A	Tube holder insert	Holds 10 mm x 75 mm tubes in the tube holders. Removed when using 12 mm x 75 mm tubes
B	Optical reference	Provides a reference for testing the rotor speed
C	Fill port	Directs saline solution into the tubes
D	Alignment markings	Provides a reference to align the rotor with the rotor shaft
E	Tube holder	Holds the tube to be processed
F	Rotor lock	Holds the tube holder during the decant step of the wash process
G	Clip	Secures the tube holder to the ring on the rotor
H	Ring	Holds the tube holders on the rotor

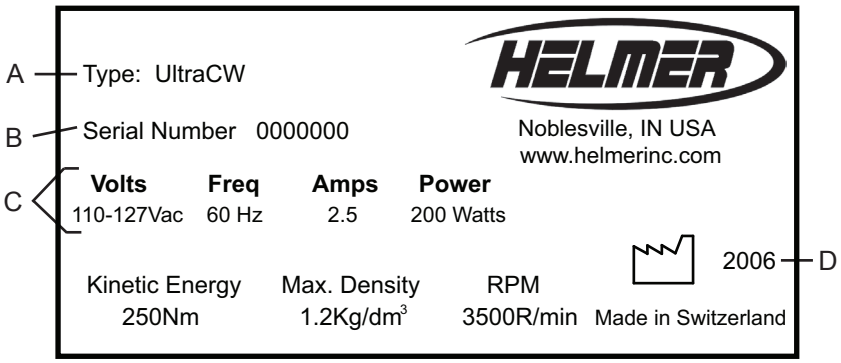
3 Installing the cell washer

After you record identifying information and select an appropriate location for the cell washer, install the cell washer.

3.1 Recording identification information

For easy reference, write the serial number on the front of this manual. The serial number is needed to provide efficient service.

The Product Specification label is located on the right side of the cell washer next to the power connector.



Product Specification label (sample)

Label	Description
A	Type (Model)
B	Serial number (S/N)
C	Power requirements
D	Date of manufacturing

3.2 Selecting an appropriate location

To optimize cell washer operation, the location for your cell washer must meet the following requirements:

- A sturdy, level surface to provide support and proper drainage
- Has a minimum of 5 inches (12 cm) of space around all sides of the cell washer for ventilation
- Has a minimum of 13 inches (33 cm) of space above the cell washer for opening the lid
- Has access to a grounded outlet meeting the electrical requirements as listed on the Product Specification label
- Has access to a saline supply
- Has access to a waste container or drain suitable to receive decanted saline and human blood waste product. For proper drainage, keep the waste container below the cell washer and the drain line as short as possible.
- Meets any additional requirements specified for your organization

WARNING: Some saline solution contains a sodium azide preservative which may react with the drain plumbing to form dangerous explosive azide salts. Check with the saline solution supplier before discharging waste solutions directly into normal drains.

3.3 Powering the cell washer

3.3.1 Installing the power cord

The power cord is included but packaged separately from the cell washer.

To install the power cord

► On the right side of the cell washer, connect the power cord to the connector.

3.3.2 Connecting to power

CAUTION: As with any electronic device, before connecting to power, make sure the cell washer is at room temperature.

To connect to power

► Plug the power cord into a grounded outlet that meets the electrical requirements that appear on the Product Specification label on the cell washer.

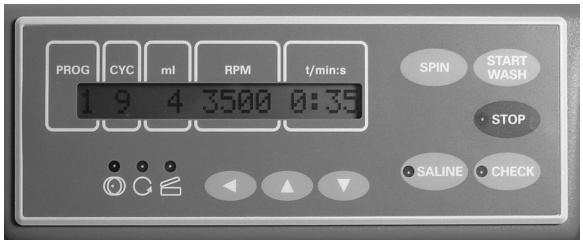
3.3.3 Turning the power on and off

The power switch is located on the right side of the cell washer.

To turn the power on

► Press the switch to the On (|) position. The software version appears on the message screen and all lamps are lit. After about eight seconds, the control panel changes to one of the following views:

► If the lid was open when the power was turned on, a summary of the washing parameters for the selected program appears on the message screen and no lamps are lit.



Control panel after initialization when the lid was open.

► If the lid was closed when the power was turned on, OPEN LID appears on the message screen and the Lid Ready lamp is lit.

Control panel after initialization when the lid was closed.

To turn the power off

► Press the switch to the Off (○) position.

3.4 Opening and closing the lid

The cell washer is equipped with an electronically controlled lock that prevents the lid from being opened during operation. The Lid Ready lamp must be lit for you to open the lid.

NOTE: If the lid is closed and there is no power to the cell washer, the lock prevents the lid from being opened. If you must open the lid in this circumstance, or if the lock is not working properly, see Section 7.4, “Releasing the lid lock” for instructions to open the lid.

Left: Handle with latch in closed position. Right: Handle with latch in open position.

To open the lid

1 On the control panel, confirm that the Lid Ready lamp is lit.
2 Lift the handle to the open position to release the latch. The Lid Ready lamp clears.
3 Raise the lid.

To close the lid

CAUTION: To prevent damage to the cell washer and its contents, avoid dropping or slamming the lid.

1 With the handle in the open position, close the lid.
2 Press down on the handle to move the latch to the closed position. OPEN LID appears on the message screen and the Lid Ready lamp lights.

3.5 Removing packaging materials

Before using the cell washer, open the lid and remove all packaging materials from the rotor and bowl.

NOTE: Keep the packaging materials for future use.

3.6 Removing the transport bolts

NOTE: Keep the transport bolts and removal tool for future use.

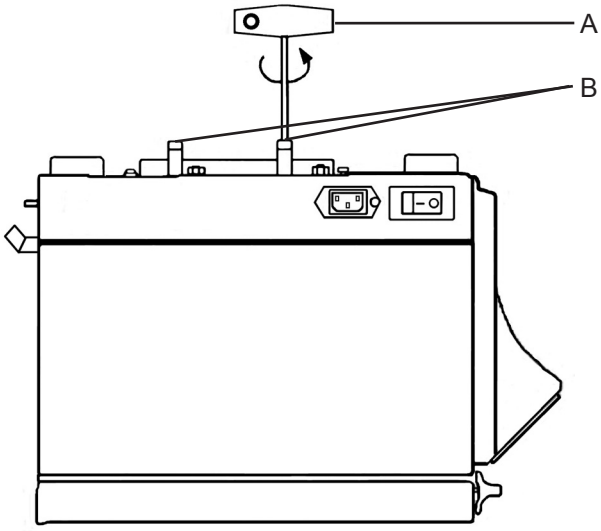
The transport bolts are located on the bottom of the cell washer. They keep the motor from moving during transport, and must be removed prior to use.

You will need the transport bolt removal tool to perform this procedure. The tool is included but packaged separately from the cell washer.

To remove the transport bolts

CAUTION: To avoid damaging parts, do not tip the cell washer on its back or side while removing the transport bolts.

1. With the power to the cell washer on, open the lid and remove the rotor. For more information and instructions, see Section 5.1.1, “Installing and removing the rotor.”
2. Close the lid and place the cell washer upside down so that the bottom faces upward.
3. On the bottom of the cell washer, locate the two transport bolts.
4. Use the bolt removal tool to remove the bolts.
5. Return the cell washer to the upright position.



View of right side of cell washer. A: Transport bolt removal tool. B: Transport bolts.

3.7 Connecting to the saline supply and drain

After installing the supply and drain tubing, connect to the saline supply and drain.

3.7.1 Installing and removing the supply and drain tubing

Tubing is used to connect to the saline supply and to the drain. The tubing is included but packaged separately from the cell washer. The smaller-diameter tubing is for the saline supply. The larger-diameter tubing is for the drain.

The supply and drain tubing should be replaced on a regular basis to prevent unexpected failure. The tubing may need to be replaced more frequently depending on how frequently the cell washer is used and policies for your organization. You will need the Drain/Fill Tubing Assembly to replace the tubing. This kit is available for purchase from Helmer. For the recommended replacement schedule, see Section 6.1, “Reviewing the preventive maintenance schedule.” For replacement part numbers, see Section 8.1.7 “Supplies.”

To install the saline supply tubing

► On the rear of the cell washer, on the supply connector, firmly press the smaller-diameter tubing around the connector until the tubing covers the barb. Twisting the tubing while pressing it onto the connector facilitates installation.

To install the drain tubing

► On the rear of the cell washer, on the drain connector, firmly press the larger-diameter tubing around the connector until the tubing covers the barb. Twisting the tubing while pressing it onto the connector facilitates installation.

To remove supply or drain tubing

CAUTION: If the vacuum is not released, the connector could break off, requiring part replacement.

► While twisting to release the vacuum, pull the tubing off the connector.

3.7.2 Connecting to the saline supply

If the connector or tubing on your saline supply is larger than that for the cell washer, you can use an adapter. The adapter is included but packaged separately from the cell washer.

To connect the adapter

1. Connect the smaller end of the adapter to the end of the supply tubing.
2. Connect the larger end of the adapter to the connector on the saline supply.

3.7.3 Connecting to the drain

The cell washer has a gravity drain. Ensure that the drain tubing flows downward, is as short as possible, and is not restricted in any way.

WARNING: Some saline solution contains a sodium azide preservative which may react with the drain plumbing to form dangerous explosive azide salts. Check with the saline solution supplier before discharging waste solutions directly into normal drains.

CAUTION: If the drain line becomes kinked or restricted, drained liquid can accumulate in the bowl and enter the tubes during the wash process, yielding unacceptable results. Excessive liquid in the bowl may also enter the motor compartment, causing motor failure.

4 Programming the cell washer

When you program the cell washer, you are defining a process which will later be automatically executed when you start the program. You control the steps of the process by setting parameters, which are viewed and changed from two menus: the Global menu and the Program menu.

This section describes the major types of processes, the steps that make up those processes, and the parameters used to control the steps. Once you are familiar with the concepts, you will be ready to plan programs for your processes, then program the cell washer to execute them at the touch of a button. For sample programs, see Section 8.2, “Sample programs.”

4.1 Understanding processes and process steps

The cell washer is capable of executing five major types of processes. Each process consists of one or more process steps.

4.1.1 Understanding processes

The major types of processes are as follows:

Washing processes. Washing processes include at least one basic wash cycle, which is composed of three steps: Fill, Spin, and Decant. Washing processes may also include one or more of the following steps: Agitation, Drop spin-down, Suspension, and Suspension-agitation.

Suspension processes. Suspension processes include one Suspension step, but exclude Fill, Spin, and Decant steps. Suspension processes may also include a Suspension-agitation step after the Suspension step.

Spinning processes. Spinning processes include one Spin step, but exclude a Fill step. Some Spinning processes may also include one or more of the following steps: Agitation and Decant.

Agitation processes. Agitation processes include one Agitation step, but no other steps.

Cleaning process. The cleaning process is a preset sequence that requires user intervention. After the user prepares the system for cleaning, the following steps are executed: Fill, Spin, Decant, Agitation, Decant. The user must then prepare the system for normal operation, then start a Refill sequence to complete the process.

4.1.2 Understanding process steps

Each process consists of one or more process steps. Each process step is controlled by setting a combination of global and program parameters. For more information about global and program parameters, see Section 4.2, “Understanding programs and parameters.”

4.1.2.1 Understanding the Fill step

During the Fill step, the tubes containing cells are filled with a specified amount of saline solution. As the rotor spins at 1100 r/min, saline is pumped from the reservoir through the flow meter to the saline dispensing nozzle. The nozzle directs the saline into the rotor, then the fill ports direct the saline into the tubes. Saline enters the tubes in a direct stream to maximize cell re-suspension.

For washing processes, this step is always executed first in the basic wash cycle (Fill, Spin, Decant). You specify the amount of saline solution with the SalWash/ml program parameter. For sample processes that include this step, see Section 8.2.1, “Sample single-cycle washing process” and Section 8.2.2, “Sample multiple-cycle washing process.”

For the cleaning process, this step is always executed first. The amount is preset at 10 ml per place on the rotor. The fill volume exceeds the capacity of the tube to aid in flushing the drainage system.

4.1.2.2 Understanding the Spin step

During the Spin step, the rotor accelerates to the specified speed, spins for the specified time, then stops quickly. This step separates out unwanted particles and creates a button of red blood cells at the bottom of each tube. The quick stopping action prevents the re-suspension of the red blood cells and dislodging of the cell button.

For washing processes, this step is always executed second in the basic wash cycle (Fill, Spin, Decant). You specify the speed with the Wash(rpm) parameter, and the duration with the Twash(min) and Twash(sec) parameters. For sample processes that include this step, see Section 8.2.1, “Sample single-cycle washing process” and Section 8.2.2, “Sample multiple-cycle washing process.”

For spinning processes, this step is always executed either first, or immediately after the optional Agitation step. You specify the speed with the Spin(rpm) parameter, and the duration with the Tspin(min) and Tspin(sec) parameters. For sample processes that include this step, see Section 8.2.5, “Sample spinning-only process,” Section 8.2.6, “Sample spinning with decanting process,” and Section 8.2.7, “Sample spinning after agitation process.”

For the cleaning process, this step is always executed after the Fill step. The speed is preset at 1500 r/min, and the duration is preset at 10 seconds.

4.1.2.3 Understanding the Decant step

During the Decant step, the rotor rapidly accelerates to the specified speed and decelerates, allowing the tubes to move back to the neutral position so the rotor lock can engage properly. The rotor spins in the opposite direction at the specified speed, while the rotor lock holds the tubes at a slight negative angle. Waste solution is expelled from the tubes by low centrifugal force, while virtually all the cells are retained in the tubes in the form of cell buttons. The waste solution is directed to the drain hole in the bowl by the drainage system. From there, the spent solution flows out of the cell washer into the drain tubing to the waste container or drain.

For washing processes, this step is always executed third in the basic wash cycle (Fill, Spin, Decant). You specify the speed with the Decant(rpm) global parameter. For sample processes that include this step, see Section 8.2.1, “Sample single-cycle washing process” and Section 8.2.2, “Sample multiple-cycle washing process.”

For spinning processes, this step is optional. For this step to be executed, both the SpinDecantM. global parameter and the SpinDecant program parameter must be enabled. This step is executed after the Spin step. You specify the speed with the Decant(rpm) global parameter. For a sample process that includes this step, see Section 8.2.6, “Sample spinning with decanting process.”

For the cleaning process, this step is executed twice: once after the Spin step, then again after the Agitation step. The speed is preset at 600 r/min.

4.1.2.4 Understanding the Drop spin-down step

During the Drop spin-down step, the rotor spins at 2000 r/min for the specified time. This action forces drops that are clinging to the sides of the tubes to the bottom of the tubes, thereby increasing the sample yield.

This step is optional and available only for washing processes. For this step to be executed, both the DSpinDown(s) global parameter and the DSpinDown program parameter must be enabled. This step is executed after the Decant step. You specify the time with the DSpinDown(s) global parameter. For a sample process that includes this step, see Section 8.2.1, “Sample single-cycle washing process.”

4.1.2.5 Understanding the Agitation step

During the Agitation step, the rotor accelerates to 200 r/min then stops, frequently and briefly, disrupting (breaking apart) the cell buttons.

You must specify either the number of agitation cycles per agitation step with the Shakings global parameter, or the duration of each agitation step with the ShakeT(min) global parameter.

For washing processes that consist of one basic wash cycle (Fill, Spin, Decant), this step is not executed. For washing processes that have multiple basic wash cycles, this step is executed between each basic wash cycle. You must specify either the number of agitation cycles per agitation step with the Shakings global parameter, or the duration of each agitation step with the ShakeT(min) global parameter. For a sample process that includes this step, see Section 8.2.2, “Sample multiple-cycle washing process.”

For spinning processes, this step is optional. For this step to be executed, both the AgitSpinM. global parameter and the Agit.Spin program parameter must be enabled. This step is executed before the Spin step. You must specify either the number of agitation cycles per agitation step with the Shakings global parameter, or the duration of each agitation step with the ShakeT(min) global parameter. For a sample process that includes this step, see Section 8.2.7, “Sample spinning after agitation process.”

For agitation processes, this step must be executed. You must set a series of global and program parameters to certain values depending on how you intend to start the process. For sample agitation-only processes, see Section 8.2.8, “Sample agitation-only processes.”

For the cleaning process, this step is always executed between the Decant steps. The number of agitation cycles is preset at 5 cycles.

4.1.2.6 Understanding the Suspension step

The Suspension step works the same as the Fill step, but is executed differently.

For this step to be executed, both the SuspensionM. global parameter and the SalSusp/ml program parameter must be enabled. You specify the amount of saline that is dispensed with the SalSusp/ml program parameter.

For washing processes, this step is optional. If enabled, this step is executed after the final Decant step, preceded by the optional Drop spin-down step. For a sample process that includes this step, see Section 8.2.1, “Sample single-cycle washing process.”

For suspension processes, this step must be executed. This step is either the first or the only step. For sample processes that include this step, see Section 8.2.3, “Sample suspension-only process” and Section 8.2.4, “Sample suspension with agitation process.”

4.1.2.6 Understanding the Suspension-agitation step

The Suspension-agitation step works the same as the Agitation step, but is executed differently.

For this step to be executed, the Suspension step must first be executed, and both the Susp.Agit. global parameter and the SalSusp/ml program parameter must be enabled. The number of agitation cycles is controlled with the Susp.Agit. global parameter (set greater than 0).

For washing processes, this step is optional. If enabled, this step is executed after the Suspension step. For a sample process that includes this step, see Section 8.2.1, “Sample single-cycle washing process.”

For suspension processes, this step is optional. If enabled, this step is executed after the Suspension step. For a sample process that includes this step, see Section 8.2.4, “Sample suspension with agitation process.”

4.2 Understanding programs and parameters

The cell washer provides two types of parameters to control the cell washer. Global parameters control the overall functionality of the cell washer, while program parameters control the execution of programs used to carry out processes.

NOTE: Be sure to verify the settings and change them according to your process needs before using the cell washer.

4.2.1 Understanding global parameters

Global parameters control overall functionality of the cell washer. Some global parameters enable or disable features that are available on the cell washer, while others specify quantities that are used in all programs.

These parameters are available to view and change through the Global menu. For more information about using the Global menu, see Section 4.3, “Viewing and changing global parameters.” For sample programs that illustrate how global parameter settings affect processes, see Section 8.2, “Sample programs.”

The following is a list of the global parameters in the order that they appear in the Global menu.

Parameter	Meaning	Available values
VOLUME ADJUST XX	The adjustment value that is used to calibrate the amount of saline that is dispensed. Each increment of 1 is equivalent to 0.5% of the volume that is measured during the calibration process. For more information, see Section 5.2.3, “Determining how much to adjust the volume.”	-20 to 20, inclusive
ROTOR: XX PLACE	The number of tube holders on the rotor	► Set to 12 for a 12-place rotor ► Set to 24 for a 24-place rotor
Decant (rpm)	The spin speed of the rotor in r/min for the Decant step in non-cleaning processes	100 to 1500, inclusive

Parameter	Meaning	Available values
Shakings or ShakeT(min)	NOTE: The design for these two parameters is different from that for other parameters. Both of these parameters are stored in the same location, and only one or the other is visible and programmable. You must change the value to switch to the other parameter. Shakings: The number of agitation cycles to perform during the Agitation step ShakeT(min): The duration of the Agitation step	IMPORTANT: By default, the Shakings parameter is selected and set to 15. To switch to the ShakeT(min) parameter, press the ▼ button until ShakeT(min) 15 appears on the message screen. Continue pressing the ▼ button to decrease the number of minutes. ► Set to 1 to 100, inclusive, to enable and set the Shakings parameter ► Set to 0 to disable the agitation step. When set to 0, the Shakings parameter is selected ► Set to 1 to 15 to enable and set the ShakeT(min) parameter
Susp.Agit.	The number of agitation cycles to perform during the Suspension-agitation step	► Set to 0 to disable the agitation step ► Set to 1 to 100, inclusive, to enable and set the parameter
D.SpinDown(s)	The duration in seconds of the Drop spin-down step	► Set to 0 to disable the Drop spin-down step ► Set to 1 to 20, inclusive, to enable and set the parameter
SuspensionM.	Shows or hides the SalSusp/ml parameter on the Program menu	► Set to NO to hide and disable the SalSusp/ml parameter ► Set to YES to show and enable the SalSusp/ml parameter
Agit.SpinM.	Shows or hides the Agit.Spin parameter on the Program menu	► Set to NO to hide and disable the Agit.Spin parameter ► Set to YES to show and enable the Agit.Spin parameter
SpinDecantM.	Shows or hides the SpinDecant parameter on the Program menu	► Set to NO to hide and disable the SpinDecant parameter ► Set to YES to show and enable the SpinDecant parameter
SOUND / BELL	Enables or disables the audible alert that sounds at the end of all processes	► Set to OFF to disable the audible alert ► Set to ON1 to enable the audible alert
CONTROL: XXX h	Version and usage information used for troubleshooting and repair	Display only. Not programmable
VERS XX °C/* 00		
FU/CCI - 1001		
FU/CCI - S. XX.XX		

4.2.2 Understanding programs and program parameters

The cell washer has three types of programs that are used to automatically perform processes.

Numbered programs. There are five programs, numbered 1 to 5, that are used to carry out washing, suspension, spinning, and agitation processes. Each of these programs has two groups of parameters. The "washing group" is used when you start the program with the START WASH button, while the "spinning group" is used when you start the program with the SPIN button. This design enables you store and run two different processes from one program location.

Spin program. The program S, or Spin, is used to carry out a basic spinning process. This program is started using the SPIN button, and contains a subset of the "spinning group" of parameters.

Clean program. The Clean Program is used to carry out a cleaning process. This program is started using the START WASH button and has no changeable parameters.

For sample programs that illustrate how program parameters are used or ignored, see Section 8.2, "Sample programs."

This type of program	Started with this button	Uses these parameters
Numbered (1-5)	START WASH	#Cyc/wash SalWash/ml Wash(rpm) Twash(min) Twash(sec) DSpinDown SalSusp/ml
	SPIN	Agit.Spin Spin (rpm) Tspin(min) Tspin(sec) SpinDecant
Spin (S)	SPIN	Spin (rpm) Tspin(min) Tspin(sec)
Clean Program	START WASH	All parameters ignored

4.2.2.1 Understanding program parameters

Program parameters control the execution of numbered programs and the Spin program. Some program parameters execute or suppress steps in a process, while others control how a step is executed. These parameters are available to view and change through the Program menu for each program.

For more information about using the Program menu, see Section 4.4, "Working with programs and program parameters." For sample programs that illustrate how program parameter settings affect processes, see Section 8.2, "Sample programs."

The following is a list of the program parameters in the order that they appear in the Program menu. Some parameters may not appear if they are disabled through a related global parameter.

Parameter	Meaning	Available values
#Cyc/wash	The number of times to perform a basic wash cycle (Fill, Spin, Decant)	For processes with basic wash cycles: ► Set to 1 for a single-cycle wash process ► Set to 2-9, as appropriate, for multi-cycle wash processes For processes without basic wash cycles: ► Set to 0 for a suspension process that does not include a prior basic wash cycle ► Set to 2 for an agitation-only process that is started using the START WASH button
SalWash/ml	Saline volume in milliliters dispensed per tube during the fill step in a basic wash cycle	► Set to 0.0 to disable the Fill step ► Set to 0.1 to 5.0, inclusive, in increments of 0.1, to enable the Fill step and dispense the set volume
Wash(rpm)	The spin speed of the rotor in r/min for the Spin step	500 to 3500, inclusive, in increments of 10
Twash(min)	The duration in minutes for the Spin step	0 to 9, inclusive
Twash(sec)	The duration in seconds for the Spin step	0 to 59, inclusive
DSpinDown (Available only if the global parameter D.SpinDown(s) is enabled)	Specifies whether to include the Drop spin-down step	► Set to ON to include the Drop spin-down step ► Set to OFF to exclude the Drop spin-down step
SalSusp/ml (Available only if the global parameter SuspensionM. is enabled.)	Saline volume in milliliters per tube for the Suspension step	► Set to 0.0 to disable the Suspension step ► Set to 0.1 to 5.0, inclusive, in increments of 0.1, to enable the Suspension step and dispense the set volume
Agit.Spin (Available only if the global parameter AgitSpinM. is enabled.)	Specifies whether to include an Agitation step before the Spin step	► Set to OFF to exclude the Agitation step. ► Set to ON to include the Agitation step.
Spin(rpm)	The spin speed of the rotor in r/min	500 to 3500, inclusive, in increments of 10
Tspin(min)	The duration in minutes for the Spin step	0 to 9, inclusive
Tspin(sec)	The duration in seconds for the Spin step	0 to 59, inclusive
SpinDecant (Available only if the global parameter SpinDecantM. is enabled.)	Specifies whether to include the Decant step	► Set to OFF to exclude the Decant step ► Set to ON to include the Decant step
PROG	The unique number for a program	► 1 to 5, inclusive, for numbered programs ► S for the Spin program ► Clean Program for the cleaning program

4.3 Viewing and changing global parameters

You can view and change global parameters through the Global menu.

For information about global parameters, see Section 4.2.1, “Understanding global parameters.” For illustrations of the default view for selected programs, see Section 4.4.1, “Selecting a program.”

4.3.1 Returning to display mode

The message screen on the cell washer must be in display mode for you to enter programming mode and view the parameters in the Global menu.

Display modes. Left: Program 1 with wash parameter summary. Middle: Spin program. Right: Clean program.

To return to display mode

► If the message screen displays a completion message, open the lid to clear the message and return to display mode. Completion messages include WASH COMPLETE, OPEN LID, SUSP.COMPLETE, and man. SUSP.DONE.

4.3.2 Viewing global parameters

To view global parameters

1. Ensure that the message screen is in display mode. For more information, see Section 4.3.1, “Returning to display mode.”
2. On the control panel, enter programming mode by pressing and holding the parameter selection button (◀) for about eight seconds until VOLUME ADJUST XX appears on the message screen.
3. Press and release the parameter selection button (◀) to cycle through the global parameters.
4. Do one of the following:
   - ► To discard your changes, press the STOP button or do not press any of the buttons for approximately 16 seconds. The message screen returns to display mode for the selected program.
   - ► To save your changes, press the START WASH button. The message screen changes to ***ok*** to indicate that the program was saved with the new values. The message screen returns to display mode for the selected program.

4.3.3 Changing global parameters

To change a global parameter value

NOTE: If you are changing any values, and do not press any of the buttons for approximately 16 seconds prior to saving, the message screen returns to the display mode for the selected program. Any changes you may have made are discarded.

1. Ensure that the message screen is in display mode. For more information, see Section 4.3.1, "Returning to display mode."
2. On the control panel, press and hold the parameter selection button (◀) for about eight seconds until VOLUME ADJUST XX appears on the message screen.
3. Press and release the parameter selection button (◀) until the parameter for which you want to change the value appears on the message screen.
4. Press and release either parameter value button (▲ or ▼) until the value that you want to use appears.
5. (Optional) Repeat steps 3-4 to change the values for additional parameters.
6. Do one of the following:
   - ► To discard your changes, press the STOP button or do not press any of the buttons for approximately 16 seconds. The message screen returns to display mode for the selected program.
   - ► To save your changes, press the START WASH button. The message screen changes to ***ok*** to indicate that the new values were saved. The message screen returns to display mode for the selected program.

4.4 Working with programs and program parameters

The cell washer has five numbered programs for carrying out washing, suspension, spinning, and agitation processes. The cell washer also has one program (S or Spin) for carrying out a basic spinning process, and one program (Clean Program) for carrying out the cleaning process.

The numbered programs and Spin program each have several program parameters, which you can view or change. For descriptions of the program parameters, see Section 4.2.2, "Understanding programs and program parameters."

4.4.1 Selecting a program

You must first select the program to start it or to view or change its parameters.

To select a program

1. Ensure that the message screen is in display mode. For more information, see Section 4.3.1, "Returning to display mode."
2. On the control panel, press and release either parameter value button (▲ or ▼) until the program that you want appears.

Selected programs. Left: Program 1. Middle: Spin program. Right: Clean program.

4.4.2 Viewing program parameters

You can view either a summary or all of the program parameters for any numbered program or the Spin program.

For descriptions of the program parameters, see Section 4.2.2, “Understanding programs and program parameters.”

4.4.2.1 Viewing a parameter summary for the selected program

When a program is selected, the values for certain program parameters are displayed under the labels on the message screen.

Parameter summaries for selected programs. Left: Program 1. Right: Spin program.

Message screen label	Parameter values displayed for Programs 1-5	Parameter values displayed for the Spin program
PROG	PROG	Spin
CYC	#Cyc/wash	
ml	SalWash/ml*	
RPM	Wash(rpm)	Spin(rpm)
t/min:s	Twash(min) and Twash(sec)	Tspin(min) and Tspin(sec)

*Although the SalWash/ml parameter is programmable to increments of 0.1 ml, only whole numbers appear on the message screen in the default view. If the volume is not a whole number, a + appears.

- ► Example 1: If the volume were 3.0, the message screen would show 3
- ► Example 2: If the volume were 3.2, the message screen would show 3+

4.4.2.2 Viewing all program parameters for the selected program

If a program parameter is not displayed as part of the summary, use the following procedure to view it.

To view all program parameters for a program

1. Select the program for which you want to view the program parameters. For instructions, see Section 4.4.1, “Selecting a program.”
2. Press and release the parameter selection button (◀) to cycle through the program parameters.
3. Press the STOP button or do not press any of the buttons for approximately 16 seconds. The message screen returns to display mode for the selected program.

4.4.3 Changing program parameters

You can change the program parameters for any numbered program or the Spin program.

For descriptions of the program parameters, see Section 4.2.2, “Understanding programs and program parameters.”

To change the Program menu parameter values in a program

NOTE: If you are changing any values, and do not press any of the buttons for approximately 16 seconds prior to saving, the message screen returns to the display mode for the selected program. Any changes you may have made are discarded.

1. Select the program for which you want to change the program parameters. For instructions, see Section 4.4.1, “Selecting a program.”
2. Press and release the parameter selection button (◀) until the parameter for which you want to change the value appears on the message screen.
3. Press and release either parameter value button (▲ or ▼) until the value that you want to use appears.
4. (Optional) Repeat steps 2-3 to change the values for additional parameters.
5. Do one of the following:
   - ► To discard your changes, press the STOP button or do not press any of the buttons for approximately 16 seconds. The message screen returns to display mode for the selected program.
   - ► To save your changes, press the START WASH button. The message screen changes to ***ok*** to indicate that the program was saved with the new values. The message screen returns to display mode for the selected program.

5 Using the cell washer

5.1 Preparing the rotor

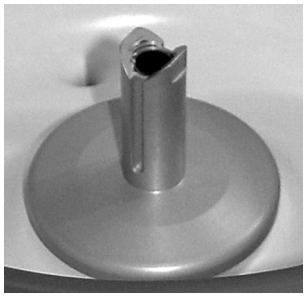
The cell washer can use either a 12-place rotor or a 24-place rotor. The rotor can hold either 10 mm x 75 mm tubes or 12 mm x 75 mm tubes.

To prepare the rotor

1. If you are using 12 mm x 75 mm tubes, remove the inserts from the tube holders. For instructions, see Section 5.1.2, “Installing and removing the tube holder inserts.”
2. Select the rotor type. For instructions, see Section 5.1.3, “Selecting the rotor type.”
3. Confirm that the rotor is balanced. For instructions, see Section 5.1.4, “Confirming that the rotor is balanced.”

5.1.1 Installing and removing the rotor

The rotor must be installed for the cell washer to operate.



Left: Rotor shaft with alignment slot visible. Right: Grasping the rotor on the grip area

To install the rotor

1. Open the lid on the cell washer. For instructions to open the lid, see Section 3.4, “Opening and closing the lid.”
2. While grasping the rotor on the grip area, place the rotor over the shaft so that the alignment markings on the top of the rotor are aligned with the slots on the rotor shaft.
3. Lower the rotor onto the shaft.

To remove the rotor

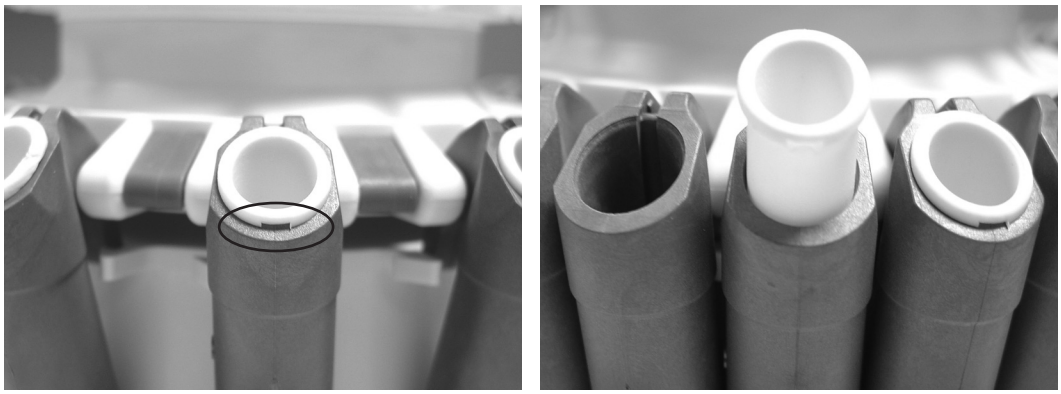
1. Open the lid on the cell washer.
2. While grasping the rotor on the grip area, lift the rotor straight up.

5.1.2 Installing and removing the tube holder inserts

The rotor is normally configured to use 10 mm x 75 mm tubes. If you want to use 12 mm x 75 mm tubes, you must remove the inserts from all the tube holders. The inserts secure the smaller tubes to prevent breakage during operation.

When the cell washer is shipped from the factory, inserts are installed. To remove them, you will need a small flat-head screwdriver.

Tube holder inserts are available for purchase from Helmer. For replacement part numbers, see Section 8.1.7 “Supplies.”



Left: Slot in insert (circled). Right: 24-place rotor with tube inserts in various stages of installation (no insert, partially installed, fully installed).

To install an insert

1. Open the lid and remove the rotor. For instructions to open the lid, see Section 3.4, “Opening and closing the lid.” For instructions to remove the rotor, see Section 5.1.1, “Installing and removing the rotor.”
2. Place the rotor on a sturdy surface.
3. While aligning the key on the insert with the groove in the tube holder, press the insert into the tube holder all the way down, as shown above.

To remove an insert

1. Place the rotor on a sturdy surface.
2. While holding the tube holder with one hand, insert the flat-head screwdriver into the slot and slightly twist the screwdriver to raise the top of the insert. Grasp the top of the insert and pull it straight out.

5.1.3 Selecting the rotor type

The cell washer can use either a 12-place rotor (standard) or a 24-place rotor (optional). You must specify which rotor you will be using so that the appropriate amount of saline solution is dispensed.

The default setting from the factory is based on the type of rotor specified at the time of purchase.

To select the rotor type

- ► Set the ROTOR: XX PLACE global parameter to the appropriate value. For more information about the ROTOR: XX PLACE parameter, see Section 4.2.1, “Understanding global parameters.” For instructions to change global parameters, see Section 4.3, “Viewing and changing global parameters.”

5.1.4 Confirming that the rotor is balanced

The rotor must be balanced for the cell washer to operate. If the rotor is not balanced, the process is stopped, IMBALANCE appears on the message screen, and the Imbalance lamp lights.

For the rotor to be balanced, tube holders and inserts must be installed correctly. For more information about tube holders, see Section 6.4, “Replacing tube holders” and Section 5.1.2, “Installing and removing the tube holder inserts.”

If the empty rotor is balanced, other causes for imbalance include uneven tube loading and improper maintenance. For more information, see Section 5.1.5, “Loading tubes” and Section 6.2, “Cleaning the cell washer.”

To confirm that the rotor is balanced

1. Remove all tubes from the tube holders.
2. Install the rotor. For instructions, see Section 5.1.1, “Installing and removing the rotor.”
3. Close the lid. For instructions, see Section 3.4, “Opening and closing the lid.”
4. Select the Spin program and change the parameter values for it to the values in the following table. For more information and instructions, see Section 4.4, “Working with programs and program parameters.”

Parameter	Value for balance check
Spin(rpm)	3500
Tspin(min)	0
Tspin(sec)	20

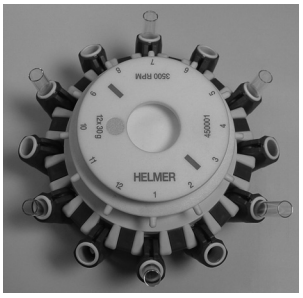
5. Press the SPIN button to start the process.
6. Do one of the following:
   - ► If OPEN LID appears on the message screen and the Lid Ready lamp lights, the rotor is balanced.
   - ► If IMBALANCE appears on the message screen and the Imbalance lamp lights, the rotor is not balanced. For information and instructions to address the problem, see Section 7.1, “Understanding and addressing error messages.”

5.1.5 Loading tubes

CAUTION:

- ► Using 10 mm x 75 mm tubes without the tube holder inserts could result in tube breakage or imbalance problems. For instructions to install the tube inserts, see Section 5.1.2, “Installing and removing the tube holder inserts.”
- ► The acceptable tolerance for tube height is 75 mm ± 1.5 mm. Tubes that are out of tolerance may not move freely around the fill port and may break.

If you are loading fewer tubes than the rotor can hold, distribute them evenly around the rotor to maintain balance. For example, if you are adding only three tubes to a 12-place rotor, add them to rotor positions 1, 5, and 9.



12-place rotor with six tubes evenly distributed (positions 1, 3, 5, 7, 9, and 11)

5.2 Calibrating the saline volume

During the Fill and Suspension steps in processes, saline solution is dispensed into the tubes. Calibrate the saline volume before first use, and regularly thereafter, to ensure that the correct amount is being dispensed.

For the recommended schedule, see Section 6.1, “Reviewing the preventive maintenance schedule.”

To calibrate the saline volume

1. Determine the volume of saline solution to dispense into each tube. For more information, see Section 5.2.1, “Determining the saline volume to dispense into each tube.”
2. Select a program and change the value of the SalWash/ml parameter to the value that you determined. For more information and instructions, see Section 4.4, “Working with programs and program parameters.”
3. Dispense and discard saline solution until the air is purged from the supply tubing. For dispensing instructions, see Section 5.2.2, “Dispensing and measuring the total saline volume.”
4. Dispense and measure the amount of saline solution that is dispensed. For instructions, see Section 5.2.2, “Dispensing and measuring the total saline volume.”
5. Determine how much to adjust the saline volume. For more information, see Section 5.2.3, “Determining how much to adjust the volume.”
6. Adjust the saline volume the amount that you determined. For instructions, see Section 5.2.4, “Adjusting the saline volume.”
7. Repeat steps 4-6 until the measured volume is in the correct range.

5.2.1 Determining the saline volume to dispense into each tube

When you set the SalWash/ml parameter for a program, you specify the volume of saline solution to dispense into each tube during the Fill step. Tubes should not be more than 80% full. The capacity of the tube may vary slightly for each tube manufacturer.

Available values for the SalWash/ml parameter are 0.0 to 5.0 ml, inclusive, in increments of 0.1 ml.

The following table provides the recommended setting for each tube size.

Tube size	Recommended volume setting (approximately 75-80% of tube capacity)
10 mm x 75 mm	3.2 ml
12 mm x 75 mm	4.7 ml

5.2.2 Dispensing and measuring the total saline volume

As part of the calibration process, measure the amount of saline solution that is dispensed. Afterwards, compare the measured value to the value that is displayed on the message screen. The value is the saline volume setting per tube multiplied by the number of places in the rotor.

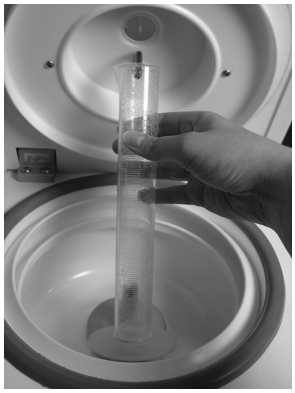
The following table shows the values that would be displayed if SalWash/ml were set to the recommended value:

Rotor type	Volume setting (per tube)	Total saline volume dispensed (±5%)
12-place	3.2 ml	38.4 ml
24-place	3.2 ml	76.8 ml
12-place	4.7 ml	56.4 ml
24-place	4.7 ml	112.8 ml

You must have a volumetric measuring device of the appropriate capacity to accurately measure the amount of solution.

To dispense and measure the total saline volume

1. Confirm that the rotor type that is selected matches what you will be using. For more information and instructions, see Section 5.1.3, “Selecting the rotor type.”
2. Select the program that contains the saline volume value that you want to use to measure the volume.
3. Open the lid. For more information and instructions, see Section 3.4, “Opening and closing the lid.”
4. On the control panel, press and hold the SALINE button for about four seconds until CALIBRATE XXX.X ml appears on the message screen. XXX.X represents the total saline volume that is dispensed. The cell washer is now in calibration mode.
5. Hold the volumetric measuring device under the nozzle.



Holding the measuring device under the nozzle

6. On the control panel, press the CHECK button. The Saline lamp lights. The volume of saline solution that was displayed is sprayed from the nozzle into the volumetric measuring device. When the process is complete, the Saline lamp clears.
7. Obtain the value from the volumetric measuring device. You will use this value to adjust the volume.

To stop the flow of saline during dispensation

► On the control panel, press the STOP button. The saline stops flowing.

5.2.3 Determining how much to adjust the volume

After measuring the total saline volume, compare the displayed value to the measured value. If the measured value is within the range (±5%) for the displayed value, no change is needed.

However, if the measured value varies more than 5% from the displayed value, you must adjust the volume to calibrate the saline volume.

When you adjust the volume, you can only adjust it in increments equivalent to 0.5% of the measured value.

To determine how much to adjust the volume

1 Compare the total volume displayed to the total volume measured.
   - ► Example 1: a check is performed for a 12-place rotor with 10 mm x 75 mm tubes and a volume of 3.2 ml per tube. The displayed amount is 38.4 ml, but the measured amount is 41.0 ml.
   - ► Example 2: a check is performed for a 24-place rotor with 12 mm x 75 mm tubes and a volume of 4.7 ml per tube. The displayed amount is 112.8 ml, but the measured amount is 106.8 ml.
   - ► Example 3: a check is performed for a 12-place rotor with 10 mm x 75 mm tubes and a volume of 3.2 ml per tube. The displayed amount is 38.4 ml, but the measured amount is 38.6 ml.

2 Determine if an adjustment is needed. If the measured value is within the tolerance of +/- 5% of the displayed value, then an adjustment is not needed.
   - ► Example 1: +/-5% of 38.4 = 1.92. 38.4 +/- 1.92 = 36.5 to 40.4. Because 41.0 is above the tolerance, an adjustment is needed.
   - ► Example 2: +/-5% of 112.8 = 5.64. 112.8 +/- 5.64 = 107.2 to 118.4. Because 106.8 is below the tolerance, an adjustment is needed.
   - ► Example 3: +/-5% of 38.4 = 1.92. 38.4 +/- 1.92 = 36.5 to 40.4. Because 38.6 is within the tolerance, an adjustment is not needed.

3 If an adjustment is needed, determine the difference in volume.
   Displayed - Measured = Difference
   - ► Example 1: The difference is 38.4 - 41.0 = -2.6 ml
   - ► Example 2: The difference is 12.8 - 106.8 = 6.0 ml

4 Determine the adjustment value, rounded to the nearest whole number.
   Difference ÷ Measured × 200 = Adjustment value
   - ► Example 1: -2.6 ÷ 41.0 × 200 = -12.7 → -13
   - ► Example 2: 6.0 ÷ 106.8 × 200 = 11.2 → 11

5.2.4 Adjusting the saline volume

After you have determined how much to adjust the volume, change the value of the VOLUME ADJUST XX global parameter by the amount that you determined. For example, if VOLUME ADJUST were set to 10, and you determined the adjustment value to be -1, then change VOLUME ADJUST to 9.

To adjust the saline volume

► Set the VOLUME ADJUST XX global parameter to the appropriate value. For more information about the VOLUME ADJUST XX parameter, see Section 4.2.1, “Understanding global parameters.” For instructions to change global parameters, see Section 4.3, “Viewing and changing global parameters.”

5.3 Starting and stopping processes

NOTE: Be sure to verify the settings and change them according to your process needs before using the cell washer. For more information, see Section 4, "Programming the cell washer."

After you have programmed your processes, you can start a program to automatically execute a process.

When you start a process, the cell washer enters process mode, during which information about each step appears on the message screen as the program progresses.

When the process is complete, a completion message appears on the message screen. If the audible alert is enabled, the alert sounds as well. The completion message remains on the screen and the audible alert repeats until you open the lid. With some exceptions, the message screen returns to display mode for the selected program.

You can stop any process before the program has finished executing. You can also pause and resume certain processes, which is useful if you have to add reagents to the tubes at a particular point in the process.

5.3.1 Starting a process

Processes are started either by pressing the START WASH button or the SPIN button.

For numbered programs, pressing the START WASH button starts a process that uses the "washing group" of parameters, while pressing the SPIN button starts processing using the "spinning group." The Spin program is started only by pressing the SPIN button. For more information about parameters used for each program type and start method, see Section 4.2.2, "Understanding programs and program parameters."

NOTE: The Clean program requires additional tasks to be completed before starting. For information and instructions to start the cleaning process using the Clean program, see Section 6.2.3, "Flushing the system."

To start a process

1. Confirm that the saline volume has been calibrated as required. For more information and instructions for calibrating, see Section 5.2, "Calibrating the saline volume."
2. Install and load the rotor. For more information and instructions, see Section 5.1, "Preparing the rotor."
3. Close the lid and ensure that the Lid Ready lamp is lit.
4. Select the program that you want to use. For instructions, see Section 4.4.1, "Selecting a program."
5. Do one of the following:
   - ► To start a process that uses the "washing group" of parameters for the selected program, press the START WASH button.
   - ► To start a process that uses the "spinning group" of parameters for the selected program, press the SPIN button.

5.3.2 Pausing and resuming a wash process

Pausing a process allows you to access the tubes during a process, then continue with the process.

When you pause a process, the process stops after the current step is completed, at which time you can open the lid. After you close the lid, you can resume the process where it left off.

You can pause and resume any multi-step process that is started with the START WASH button. If a process is paused, you cannot stop the process until you have resumed it.

To pause a wash process

► On the control panel, press the CHECK button. The Check lamp lights. After the current step is completed, the program is paused. OPEN LID appears on the message screen and the Lid Ready lamp lights. At this time, you can open the lid, which clears the Lid Ready lamp. The Check lamp remains lit to indicate that the process is paused.

To resume a paused wash process

1 Confirm the following:
- ► The rotor is installed
- ► The lid is closed
- ► The program that is selected is the same one that was selected when the process was started
- ► The Lid Ready and Check lamps are lit.

2 On the control panel, press the START WASH button. The Check lamp clears and the process resumes.

5.3.3 Stopping a process

Stopping a process allows you to end the process.

When you stop a process, the process stops before the current step is completed. After the rotor has stopped spinning, a completion message is displayed on the message screen. Opening the lid returns the cell washer to display mode for the selected program.

To stop a process

1 On the control panel, press and hold the STOP button until the Stop lamp lights. When the rotor stops spinning, OPEN LID appears on the message screen and the Lid Ready lamp lights. If enabled, an audible alert sounds every 30 seconds until you open the lid.

2 Open the lid to access the tubes and return the cell washer to display mode for the selected program.

5.4 Controlling audible alerts for process completion

When a wash or spin process is complete, an audible alert sounds. You can enable or disable this alert using the SOUND/BELL global parameter.

For more information about the SOUND/BELL global parameter, see Section 4.2.1, “Understanding global parameters.” For instructions to change global parameters, see Section 4.3, “Viewing and changing global parameters.”

Audible alerts also sound when the cell washer is in error mode; however, error alerts cannot be disabled. For more information about error mode, see Section 7.1, “Understanding and addressing error messages.”

6 Maintaining the cell washer

CAUTION: Long-term exposure to certain preservatives found in azide-free saline solutions may adversely effect certain plastic components within the cell washer. Routine housekeeping and cleaning practices will help to remove salt deposits in, and prolong the life of, these components.

6.1 Reviewing the preventive maintenance schedule

For optimal performance, complete maintenance tasks according to the following schedule.

NOTE: Regulations for your organization or physical conditions at your organization may require maintenance items to be performed more frequently, or only by designated service personnel. Follow the guidelines for your organization.

Task	Daily	Weekly	Monthly	Annually
Inspect the tubing and drain and clear obstructions if necessary.	✓			
Inspect the tubing connections and secure them if necessary.	✓			
Clean and dry the interior after normal usage to prevent corrosion and contamination. ► For more information and instructions, see Section 6.2.2, “Cleaning the interior.”	✓			
Flush the system. ► For more information and instructions, see Section 6.2.3, “Flushing the system.”		✓		
Clean the fill ports on the rotor. ► For more information and instructions, see Section 6.2.4, “Cleaning the fill ports.”		✓		
Check the saline volume setting and calibrate it if necessary. Frequency varies by length of service. ► For more information and instructions, see Section 5.2, “Calibrating the saline volume.”		✓ During first month of usage	✓ After first month of usage	
Inspect the rotor for wear, corrosion, and damage. Replace the rotor if these conditions exist, or after the rotor has been in use for 5 years.			✓	
Inspect the tube holders for wear and damage. Replace tube holders if they are worn or damaged, or after they have been in use for 2 years. ► For more information and instructions, see Section 6.4, “Replacing tube holders.”			✓	
Clean the exterior. ► For more information and instructions, see Section 6.2.1 “Cleaning the exterior.”			✓	
Replace the supply and drain tubing. ► For more information and instructions, see Section 3.7.1, “Installing and removing the supply and drain tubing.”				✓

Task	Daily	Weekly	Monthly	Annually
Replace the pump tubing. ► For more information and instructions, see Section 6.3, “Replacing the pump tubing.”				✓
Replace the tube holder inserts for 10 mm x 75 mm tubes. ► For more information and instructions, see Section 5.1.2, “Installing and removing the tube holder inserts.”				✓

6.2 Cleaning the cell washer

WARNING: Do not use an autoclave to clean any components of the cell washer.
Only use cleansers and disinfectants with a pH of 5 to 8.
Follow all chemical handling and disposal requirements and procedures specified by your organization. For more information, see Section 1, “Working safely.”

6.2.1 Cleaning the exterior

Clean the exterior with soap or mild cleaning agent and water. Dry the exterior with a dry cloth or sponge.

6.2.2 Cleaning the interior

To prevent blockages and maintain rotor balance, ensure that the bowl is clean and free of debris, which may include salt crystals or broken glass. To prevent condensation that may lead to corrosion, dry the interior thoroughly after normal daily usage.

Using a damp cloth or sponge, wipe the bowl, removing all debris. It is not necessary to remove or clean under the bowl.

Using a dry cloth or sponge, wipe the entire inside of the lid, including the drainage system and painted surfaces.

Use the following procedures to remove and install the drainage rings.

To remove the drainage rings

1. Remove the upper drainage ring, which is labeled “this side up,” by pulling it upward until it clears the gasket.
2. Remove the lower drainage ring by folding back the gasket to expose the edge of the ring, then gently lifting the ring. Do this in sections at a time until the entire ring is clear of the gasket and can be lifted out of the bowl.

Left: Gasket folded back and section of lower drainage ring loosened. Right: whole lower drainage ring loosened.

To install the drainage rings

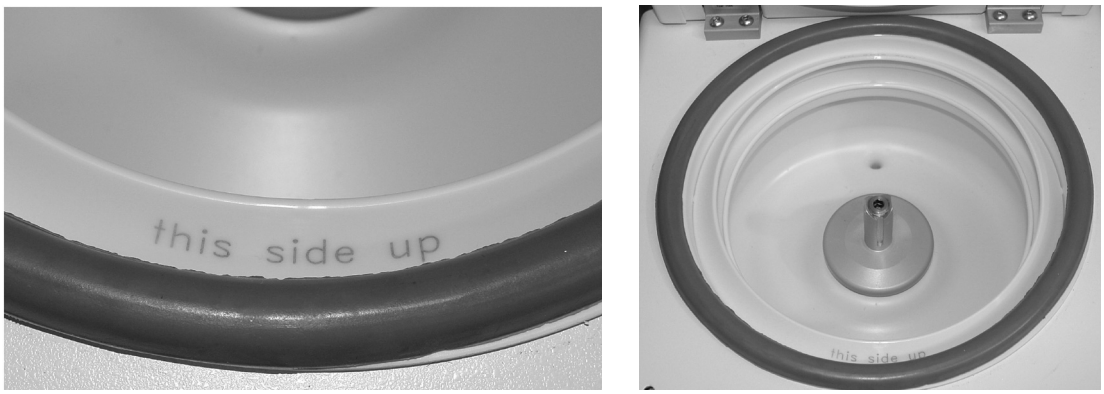
1 Place the lower drainage ring in the bowl so that the drain hole in the ring is directly above the drain in the bowl.

Left: Lower drainage ring placed in the bowl. Right: Drain holes aligned.

2 Working in sections at a time around the bowl, fold back the gasket and press the ring downwards so that the edge of the drainage ring rests on the lip of the bowl. The edge of the ring should slightly overlap the lip of the bowl.

Lower drainage ring in the proper position in the bowl. The arrow points to the edge of the ring.

3 With the labeled side up, place the upper drainage ring into the bowl on top of the lower ring.



Left: Label on upper drainage ring. Right: Drainage rings installed.

6.2.3 Flushing the system

To clean and disinfect the cell washer, as well as remove blockages due to salt crystallization, use the Clean Program to flush the system with bleach solution and again with distilled water.

The Clean Program consists of two parts: the Clean sequence and the Refill sequence. These sequences cannot be changed, nor can they be stopped before completion.

The Clean sequence consists of the following steps:

- Fill. Dispenses 10 ml of liquid per place on the rotor, regardless of the tube size, while spinning at 1100 r/min. For a 12-place rotor, 120 ml of liquid is dispensed; for a 24-place rotor, 240 ml is dispensed. The fill volume exceeds the capacity of the tube to aid in flushing the drainage system.
- Spin. Spins for 10 seconds at 1500 r/min
- Decant. Spins in the opposite direction at 600 r/min.
- Agitation. Agitates for 5 cycles.
- Decant. Spins in the opposite direction at 600 r/min.

The Refill sequence dispenses 60 ml of liquid, regardless of the rotor type, to purge the system.

When you run the Clean Program, the rotor must be loaded with tubes, but every other position on the rotor must be empty. This allows some of the liquid to be dispensed directly into the bowl to aid with cleaning, and some of the solution to flow into the drainage system during the Decant step.

You will need the following to complete this procedure:

- A container filled with approximately 500 ml of fresh bleach solution. Solution is a 10% bleach solution (1:9 ratio of household bleach to water, or 1 part commercial sodium hypochlorite (NaOCl) (5%) to 9 parts water).
- A container filled with approximately 1 liter of distilled water.
- An empty waste container, such as a volumetric measuring device, that has a minimum capacity of 80 ml.

To flush the system

NOTE: Repeat this procedure as many times as necessary according to the regulations for your organization.

1. Load the rotor with tubes, leaving every other position on the rotor empty. For example, for a 12-place rotor, put tubes in places 1, 3, 5, 7, 9, and 11. For more information and instructions, see Section 5.1.5, “Loading tubes.”
2. Install the rotor in the cell washer, close the lid, and ensure that the Lid Ready lamp is lit. For instructions, see Section 5.1.1, “Installing and removing the rotor.”
3. Connect the supply tubing to the container of bleach solution.
4. Flush the system with bleach solution.
   a. Select the Clean Program. For instructions, see Section 4.4.1, “Selecting a program.”
   b. Press the START WASH button. The cleaning sequence starts. When the cleaning sequence is complete, OPEN LID appears on the message screen and the Lid Ready lamp lights.
   c. Open the lid. The Lid Ready lamp clears and Clean proc. DONE appears on the message screen.
5. Connect the supply tubing to the container of distilled water.

6 Purge the bleach solution from the system.

a Hold the waste container in front of the nozzle.

Holding the waste container in front of the nozzle

b On the control panel, press and hold the SALINE button for about three seconds until the Saline lamp lights and REFILL process appears on the message screen. 60 ml of liquid is dispensed from the nozzle into the waste container. When the process is complete, the Saline lamp clears and REFILL proc.DONE briefly appears on the message screen, followed by display mode for Program 1.

c Dispose of the purged liquid.

7 Flush the system with distilled water. For instructions, see Step 4.

8 Connect the supply tubing to the container of saline solution.

9 Purge the distilled water from the system. For instructions, see Step 6. The cell washer is ready for use.

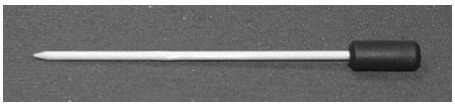
6.2.4 Cleaning the fill ports

Clean the fill ports on the rotor regularly to remove any debris that was not removed when the system was flushed. Debris can clog the fill ports, preventing saline solution from entering the tubes.

If you allow the rotor to dry after washing or suspension processes, debris may accumulate in the fill ports more quickly. If this is the case, the rotor may need to be cleaned more frequently than is recommended in the preventive maintenance schedule. Adjust the cleaning frequency based on your usage patterns.

You will need the following to complete this procedure:

- A container large enough to hold the rotor.
- A source of warm water to soak or flush the rotor.
- The bypass tool. This tool is included but packaged separately from the cell washer.



Bypass tool

To clean the fill ports

CAUTION: Cleaning the fill ports using methods other than what is described here could damage the fill ports and alter the results, which may void your warranty.

1. Soak the rotor in clean warm water or directly run warm water into the top of the rotor for several minutes and make sure water is flowing freely out of all the fill ports.
2. If a port is blocked, gently slide the bypass tool into the fill port from the outside toward the center of the rotor. Gently slide the bypass tool in and out several times to clean the port.
3. Do one of the following:
   - If the rotor will not be used immediately, ensure that it is dry before returning it to the cell washer and closing the lid.
   - If the rotor will be used immediately, ensure that all fresh water has been purged from the system and replaced by saline solution before processing. For instructions to flush the system, see Section 6.2.3, “Flushing the system.”

6.3 Replacing the pump tubing

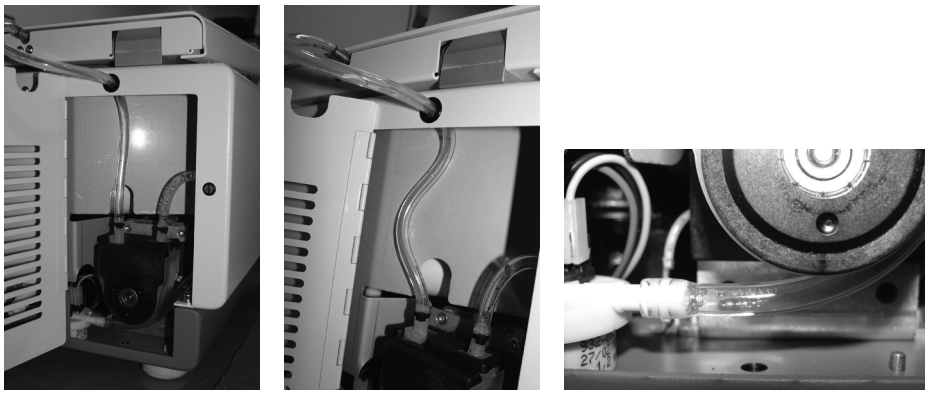
Replace the tubing regularly to prevent unexpected failure. The tubing may need to be replaced more often than recommended in the preventive maintenance schedule if you use your cell washer frequently, or policies for your organization require more frequent replacement.

WARNING: Follow all chemical handling and disposal requirements and procedures specified by your organization. For more information, see Section 1, "Working safely."

You will need the Pump Tubing Assembly to replace the pump tubing. This kit is available for purchase from Helmer. For replacement part numbers, see Section 8.1.7 "Supplies."

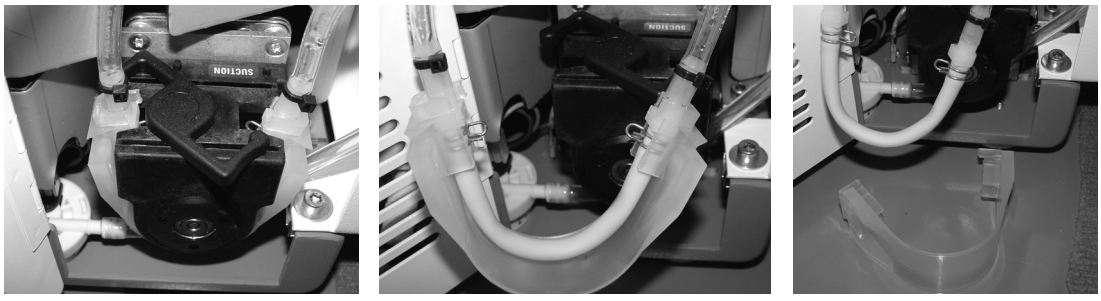
To replace the pump tubing

1. Turn off the cell washer and disconnect it from power.
2. Disconnect the supply tubing from the saline supply.
3. On the rear of the cell washer, open the access door.



Left: Overall view of the pump area. Middle: Detail of pump tubing from the pump through the grommet to the fitting on the lid. Right: Detail of pump tubing connected to the fitting on the flow meter.

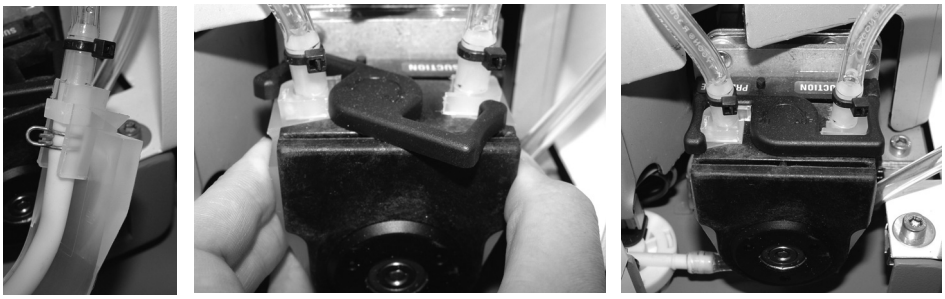
4. Remove the existing tubing assembly.
   a. On the top of the pump, turn the locking lever clockwise until the tubing holder loosens.
   b. Free the tubing and tubing holder from around the pump.
   c. Remove the tubing from the tubing holder.
   d. Disconnect the ends of the tubing from the fittings.
   e. Pull the tubing through the grommet toward the pump, and remove it from the pump area.



Left: Pump with loosened tubing holder. Middle: Tubing and holder freed from pump. Right: Tubing removed from the holder.

5 Install the new tubing assembly.

- **a** Orient the tubing assembly so that the middle section of tubing is aligned with the tubing holder, then press the tubing into the holder.
- **b** Wrap the tubing holder around the pump so the middle section of tubing is against the pump.
- **c** While squeezing the tubing holder around the pump, turn the locking lever counter-clockwise until it locks in position.
- **d** Thread the tubing out through the grommet, then connect it to the fitting on the back of the lid.
- **e** Connect the right side of the tubing to the fitting on the flow meter.



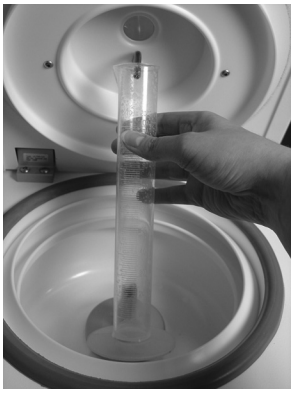
Left: Detail of the middle section of the pump tubing oriented in the tubing holder.
Middle: Tubing holder wrapped around the pump and squeezed in position.
Right: Holder locked in position around the pump with the right side of the tubing connected to the fitting on the flow meter.

6 Connect the supply tubing to the saline supply.

7 Connect the cell washer to power and turn it on.

8 Using the volume calibration check function to dispense liquid, check for leaks around the connections to the fittings.

- **a** On the control panel, press and hold the SALINE button for four seconds. On the message screen, CALIBRATE XXX.X ml appears, where XXX.X is the saline volume that is dispensed.
- **b** Hold a waste container under the nozzle.
- **c** On the control panel, press the CHECK button. Solution is sprayed from the nozzle into the waste container, purging the system of fresh water.



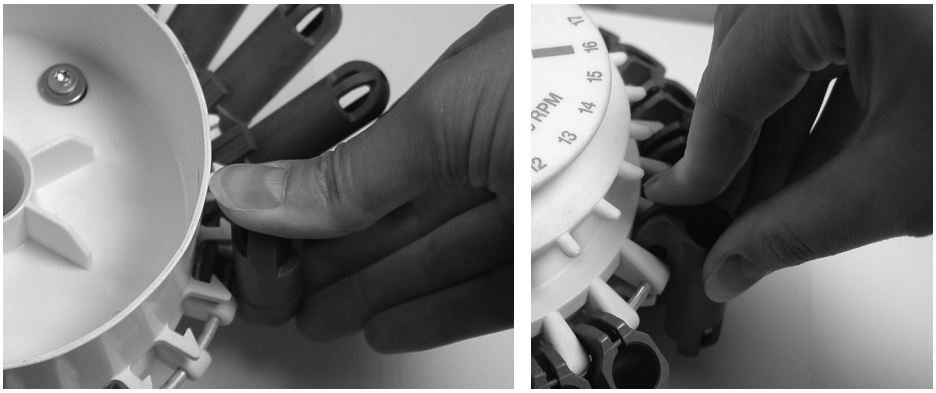
Holding the waste container under the nozzle

6.4 Replacing tube holders

All available places on the rotor must have tube holders installed for the rotor to be balanced.

Use the following procedure to replace damaged or worn tube holders.

Tube holders are available for purchase from Helmer. For replacement part numbers, see Section 8.1.7 “Supplies.”



Left: Rotor turned upside-down with tube holder to be removed. Right: Tube holder to be installed

To remove a tube holder from the rotor

1. Remove the rotor from the cell washer.
2. Remove all tubes from the tube holders.
3. Turn the rotor upside down.
4. Move the rotor lock so that it clears the clip.
5. While holding the tube holder that you want to remove in the vertical position, firmly press the tube holder down until the clip snaps free from the ring.

To add a tube holder to the rotor

1. Remove the rotor from the cell washer.
2. Remove all tubes from the tube holders.
3. In the appropriate position on the rotor, align the clip for the tube holder over the ring on the rotor.
4. Firmly press the tube holder down until the clip snaps into place around the ring.

7 Understanding and addressing operational issues

This section describes issues that you may experience while using the cell washer, and provides actions that you can take to correct them.

7.1 Understanding and addressing error messages

When the cell washer is in error mode, the cell washer is not operational. The error must be addressed and cleared.

When the cell washer is in error mode, an audible alert sounds. The pattern is a beep every 30 seconds. A message also appears on the message screen to aid in troubleshooting and correction.

Some error messages appear as a result of operational issues. As a user, you can address operational issues to clear the error message. If the problem remains, you may need to contact a qualified service technician to troubleshoot and address the problem.

Several actions require that you reset the power. To reset the power, turn off the power and leave it off for about ten seconds before turning it back on.

Error message	Possible cause	Action
CONTROL - ERROR XX	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
FU / CCI - ERROR XX	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
IMBALANCE	The tubes are not loaded evenly around the rotor.	► Check the placement of tubes. Move tubes to balance the rotor if necessary. For more information, see Section 5.1.5, “Loading tubes.” ► Reset the power to clear the error message.
	The flow of saline solution to the tubes is blocked, causing one or more tubes to be under-filled.	► Flush the system to clear blockages. For more information, see Section 6.2.3, “Flushing the system.”. ► Check the fill ports on the rotor for obstructions. Clean the fill ports as necessary. For more information, see Section 6.2.4, “Cleaning the fill ports.” ► Reset the power to clear the error message.
	One or more tube holders is missing or not secured to the rotor.	► Check the tube holders to make sure that they are installed on the rotor correctly. For more information and instructions, see Section 6.4, “Replacing tube holders.” ► Reset the power to clear the error message.

Continued

Error message	Possible cause	Action
Continued IMBALANCE	Inserts are not installed correctly (applies to 10 mm x 75 mm configuration only).	► Check that the inserts are installed correctly in all the tube holders. For more information, see Section 5.1.2, "Installing and removing the tube holder inserts." ► Reset the power to clear the error message.
	The rotor lock did not engage or disengage properly during a Decant step.	► Contact a qualified service technician.
	A component is faulty.	► Contact a qualified service technician.
LOW SALINE	The saline supply is empty.	► Check the saline supply. Replace the supply if necessary. ► Open and close the lid to clear the error message.
	The flow of saline is stopped or blocked.	► Check the supply and pump tubing for kinks. Straighten out the tubing if necessary. ► Check the tubing, adapters, and connectors for obstructions. Clean or replace components as necessary. For cleaning instructions, see Section 6.2, "Cleaning the cell washer." For supply tubing replacement instructions, see Section 3.7.1, "Installing and removing the supply and drain tubing." For pump tubing replacement instructions, see Section 6.3, "Replacing the pump tubing." ► Open and close the lid to clear the error message.
	A component is faulty.	► Contact a qualified service technician.
N < MIN XX	There is excessive water in the bowl because it could not drain properly.	► Check the drain tubing for kinks. Straighten out the tubing if necessary. ► Confirm that the drain tubing is lower than the cell washer. Adjust the placement as necessary. ► Check the tubing, adapters, and connectors for obstructions. Clean or replace components as necessary. For cleaning instructions, see Section 6.2, "Cleaning the cell washer." For drain tubing replacement instructions, see Section 3.7.1, "Installing and removing the supply and drain tubing." ► Reset the power to clear the error message.
	A component is faulty or internal connections are loose.	► Contact a qualified service technician.

Error message	Possible cause	Action
N > MAX XX	A component is faulty or internal connections are loose.	► Contact a qualified service technician.
POWER INTERRUPT	There was a power outage.	► Open the lid and press the START WASH button to clear the error message.
	The connections for the power cord are loose.	► Check the power cord connections and tighten them if necessary. ► Open the lid and press the START WASH button to clear the error message.
SER I/O - ERROR XX	The saline overflowed because it could not drain properly.	► Check the drain tubing for kinks. Straighten out the tubing if necessary. ► Confirm that the drain tubing is lower than the cell washer. Adjust the placement as necessary. ► Check the tubing, adapters, and connectors for obstructions. Clean or replace components as necessary. For cleaning instructions, see Section 6.2, “Cleaning the cell washer.” For drain tubing replacement instructions, see Section 3.7.1, “Installing and removing the supply and drain tubing.” ► Reset the power to clear the error message.
TACHO - ERROR XX	A process was started without the rotor installed.	► Confirm that the rotor is installed. ► To clear the error message, do the following: **1** Open the lid. **2** While spinning the rotor clockwise by hand, reset the power.

7.2 Addressing performance problems

This section explains performance-related problems that may occur with the cell washer.

NOTE: Be sure that you have followed the appropriate laboratory procedures and used the appropriate materials for the task.

Problem	Possible Cause	Action
The results of the wash process are not acceptable.	The rotor type that is programmed does not match what is being used.	► Verify that the rotor type is set correctly. Change it if necessary. For instructions, see Section 5.1.3, "Selecting the rotor type."
	One or more fill ports is clogged.	► Flush the system to clear blockages. For more information, see Section 6.2.3, "Flushing the system.". ► Check the fill ports on the rotor for obstructions. Clean the fill ports as necessary. For more information, see Section 6.2.4, "Cleaning the fill ports."
	The saline flow is blocked, too low, or being sensed incorrectly.	► On the message screen, check if LOW SALINE appears. If so, see Section 7.1, "Understanding and addressing error messages."
	Too much or not enough saline solution is being dispensed.	► Verify that the saline volume is programmed correctly and change it if necessary. For instructions, see Section 4.4, "Working with programs and program parameters." ► Verify that the amount of saline being dispensed is correct. Calibrate the saline volume if necessary. For instructions, see Section 5.2, "Calibrating the saline volume."
	The drain is blocked, causing excessive saline to accumulate in the bowl and enter the tubes during the wash process.	► Inspect the drain and drain tubing for kinks and obstructions. Straighten the tubing and clear obstructions if necessary. ► Verify that the drain tubing and waster container are lower than the cell washer for proper drainage. Adjust the placement if necessary.
	The decant speed is too high or low.	► Change the decant speed. For instructions, see Section 4.3.3, "Changing global parameters."

Problem	Possible Cause	Action
A cell button has not formed or is too small.	A 12-place rotor is being used, but a 24-place rotor is programmed.	► Verify that the rotor type that is programmed matches what is being used. Change it if necessary. For instructions, see Section 5.1.3, "Selecting the rotor type."
	The tube holder is stuck in the decant position.	► Contact a qualified service technician.
	The spin speed is too low.	► Increase the spin speed and repeat the process. For instructions, see Section 4.4, "Working with programs and program parameters."
After washing, too much residual saline remains in the tube.	The decant speed is too low.	► Change the decant speed. For instructions, see Section 4.3.3, "Changing global parameters."
The tubes were not decanted.	The decant speed is too low.	► Change the decant speed. For instructions, see Section 4.3.3, "Changing global parameters."
	A component is faulty.	► Contact a qualified service technician.
	The rotor lock did not engage.	► Contact a qualified service technician.
After the tubes are decanted, the contents are streaking.	The decant speed is too high.	► Change the decant speed. For instructions, see Section 4.3.3, "Changing global parameters."

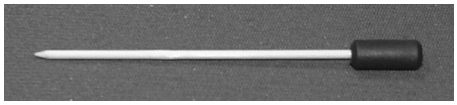
7.3 Addressing equipment problems

Problem	Possible Cause	Action
Nothing is displayed on the message screen.	The cell washer is turned off.	► Verify that the cell washer is turned on.
	There is no power to the cell washer.	► Verify that the power cord is connected securely to the cell washer and the outlet. Tighten the connections if necessary. ► Verify that the fuse has not blown. Replace the fuse if necessary. ► Verify that the outlet is operational.
During a saline check, the pump is not making any sound and saline is not being dispensed.	A component is faulty.	► Contact a qualified service technician.

7.4 Releasing the lid lock

The UltraCW is equipped with an electronically controlled lock that prevents the lid from being opened during operation. If the lock is not working properly, or if the lid is closed and there is no power to the cell washer, you can release the lock manually.

You will need the bypass tool to perform this procedure. The bypass tool is included but packaged separately from the cell washer.



Left: Releasing the lid lock. Right: Bypass tool

To release the lid lock using the bypass tool

WARNING: Before you release the lid lock, make sure the rotor has stopped spinning.

1. Turn off the unit and disconnect it from power.
2. Ensure that the rotor has stopped.
3. On the front of the cell washer, insert the bypass tool horizontally into the access hole until it stops.
4. While lifting the lid handle, gently press downward on the handle of the bypass tool until the lock releases.

8 Reference information

This section includes technical specifications and sample programs.

8.1 Technical Specifications

8.1.1 Power

8.1.1.1 Input power

Input power varies depending on the destination of the cell washer. The input power required for a particular cell washer is specified on the Product Specification label. The following options are available:

- 110 V to 127 V, 60 Hz
- 207 V to 253 V, 50 Hz to 60 Hz

8.1.1.2 Power consumption

Consumption: 2.5 A

8.1.1.3 Fuses

Fuse rating: 2.5 A

8.1.2 Weight

Weight: 51.5 lb (23.5 kg)

8.1.3 Size

The following are the overall exterior dimensions:

- Width: 13 in (33 cm)
- Depth: 15.5 in (39.5 cm) plus 1.25 in (3 cm) for the connectors
- Height: 11 in (28 cm) with lid closed; 22.5 in (57 cm) with lid open

8.1.4 Other specifications

Max RPM: 3500 r/min ± 20 r/min

Kinetic Energy: 250 Nm

Maximum Density: 1.2 Kg/dm^3

8.1.5 Operating conditions

Ambient temperature: 5 ºC to 40 ºC

Maximum loading weight including tubes and contents: printed on top of rotor

8.1.6 Energy conservation and regulatory compliance

This product is compliant with IEC 61010-2-020 and applicable provisions.

8.1.7 Supplies

Description	Part number
Tube holder insert	E2551
Tube holder (12 mm x 75 mm)	E2197 Also available in a Kit (12 pieces): 400596-1
Pump tubing assembly	450005-1 Also part of the Tubing kit (450003-1), which includes the Drain/fill tubing assembly
Drain/fill tubing assembly	450006-1 Also part of the Tubing kit (450003-1), which includes the Pump tubing assembly

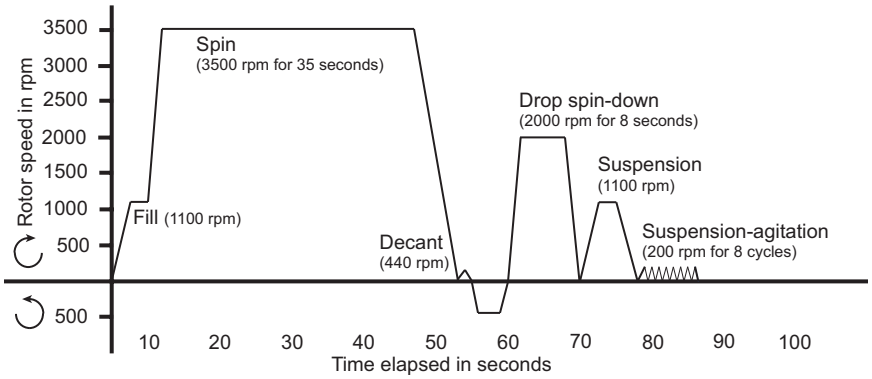
8.2 Sample programs

This section provides sample programs to further illustrate the effect of different settings on processes. For more information and instructions about programming, see Section 4, “Programming the cell washer.”

NOTE: These programs are samples only. The cell washer has not been pre-programmed with these settings.

8.2.1 Sample single-cycle washing process

For this sample, the process would be started by pressing the START WASH button.



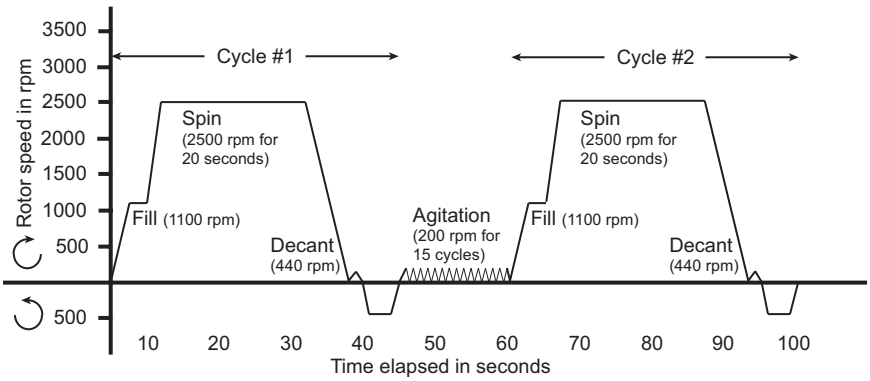
Sample single-cycle washing process with optional Drop spin-down, Suspension, and Suspension-agitation steps

Global parameter settings (single-cycle washing process example)		
Global parameter	**Value**	**Explanation**
VOLUME ADJUST XX	Any	Value depends on the calibration
ROTOR: XX PLACE	Any	Value depends on the rotor being used.
Decant (rpm)	440	Decant at 440 r/min
Shakings or ShakeT(min)	Any	For a single-cycle washing process, there is no agitation step, so this parameter is ignored.
Susp.Agit.	8	After the Suspension step, enable the suspension-agitation step and agitate for 8 cycles
D.SpinDown(s)	8	After the decant step, enable the Drop spin-down step and spin for 8 seconds
SuspensionM.	YES	Show the SalSusp/ml parameter in the program parameter menu
Agit.SpinM.	Any	These parameters are ignored for processes started using the START WASH button.
SpinDecantM.	Any	
SOUND/BELL	Any	This parameter does not affect processes

Program parameter settings (single-cycle washing process example)		
Program parameter	**Value**	**Explanation**
#Cyc/wash	1	Single-cycle wash
SalWash/ml	Any	Use the appropriate wash volume for the tube size that you are using.
Wash(rpm)	3500	During the Spin step, spin the rotor at 3500 r/min
Twash(min)	0	Run the Spin step for 0 minutes and 35 seconds
Twash(sec)	35	
DSpinDown	ON	After the decant step, include the Drop spin-down step
SalSusp/ml	Any	Use the appropriate suspension volume for the tube size that you are using.
Agit.Spin	Any	These parameters are ignored for processes started using the START WASH button.
Spin(rpm)	Any	
Tspin(min)	Any	
Tspin(sec)	Any	
SpinDecant	Any	
PROG	Any (1-5)	Any numbered (1-5) program

8.2.2 Sample multiple-cycle washing process

For this sample, the process would be started by pressing the START WASH button.



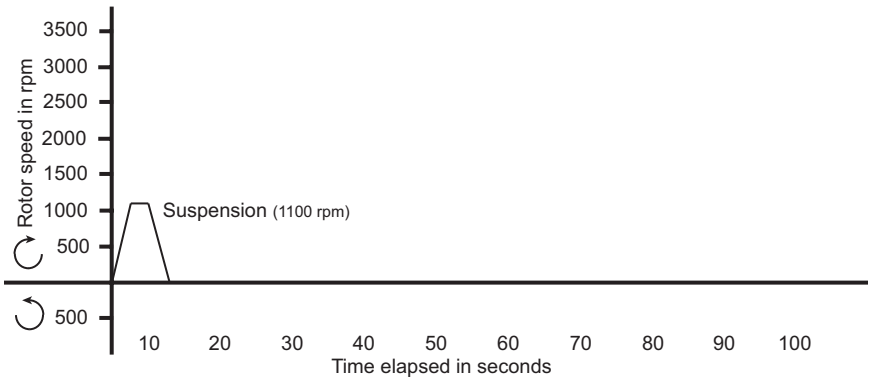
Sample multiple-cycle washing process

Global parameter settings (multiple-cycle washing process example)		
Global parameter	**Value**	**Explanation**
VOLUME ADJUST XX	Any	Value depends on the calibration
ROTOR: XX PLACE	Any	Value depends on the rotor being used.
Decant (rpm)	440	Decant at 440 r/min
Shakings or ShakeT(min)	15 Shakings	Between wash cycles, agitate for 15 cycles.
Susp.Agit.	Any	This parameter is ignored because this process does not have a Suspension step.
D.SpinDown(s)	Any	► Set to 0 to disable the Drop spin-down step for all programs. ► Set to a value greater than 0 to disable the Drop Spin-down step for this program only.
SuspensionM.	Any	► Set to NO to disable the Suspension step for all programs. ► Set to YES to disable the Suspension step for this program only.
Agit.SpinM.	Any	These parameters are ignored for processes started using the START WASH button.
SpinDecantM.	Any	
SOUND/BELL	Any	This parameter does not affect processes

Program parameter settings (multiple-cycle washing process example)		
Program parameter	**Value**	**Explanation**
#Cyc/wash	2	Two-cycle wash
SalWash/ml	Any	Use the appropriate wash volume for the tube size that you are using.
Wash(rpm)	2500	During the Spin step, spin the rotor at 2500 r/min
Twash(min)	0	Run the Spin step for 0 minutes and 20 seconds
Twash(sec)	20	
DSpinDown	OFF	If this parameter appears, set it to OFF to disable the Drop spin-down step.
SalSusp/ml	0	If this parameter appears, set it to 0 to disable the Suspension step.
Agit.Spin	Any	These parameters are ignored for processes started using the START WASH button.
Spin(rpm)	Any	
Tspin(min)	Any	
Tspin(sec)	Any	
SpinDecant	Any	
PROG	Any (1-5)	Any numbered (1-5) program

8.2.3 Sample suspension-only process

For this sample, the process would be started by pressing the START WASH button.



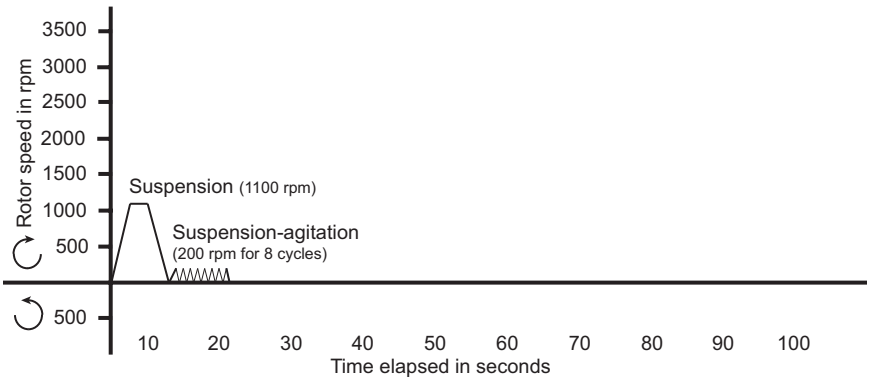
Sample suspension-only process

Global parameter settings (suspension-only process example)		
Global parameter	**Value**	**Explanation**
VOLUME ADJUST XX	Any	Value depends on the calibration
ROTOR: XX PLACE	Any	Value depends on the rotor being used.
Decant (rpm)	Any	This parameter is ignored for processes that are started with the START WASH button, but do not have a Fill step.
Shakings or ShakeT(min)	Any	This parameter is ignored for processes that have no wash cycles.
Susp.Agit.	0	Disable the suspension-agitation step.
D.SpinDown(s)	Any	► Set to 0 to disable the Drop spin-down step for all programs. ► Set to a value greater than 0 to disable the Drop Spin-down step for this program only.
SuspensionM.	YES	Show the SalSusp/ml parameter in the program parameter menu.
Agit.SpinM.	Any	These parameters are ignored for processes started using the START WASH button.
SpinDecantM.	Any	
SOUND/BELL	Any	This parameter does not affect processes

Program parameter settings (suspension-only process example)		
Program parameter	**Value**	**Explanation**
#Cyc/wash	0	Do not run any wash cycles.
SalWash/ml	0.0	Disable the Fill step.
Wash(rpm)	Any	This parameter is ignored if there are no wash cycles.
Twash(min)	0	Disable the Spin step.
Twash(sec)	0	
DSpinDown	OFF	If this parameter appears, set it to OFF to disable the Drop spin-down step.
SalSusp/ml	Any	Use the appropriate suspension volume for the tube size that you are using.
Agit.Spin	Any	These parameters are ignored for processes started using the START WASH button.
Spin(rpm)	Any	
Tspin(min)	Any	
Tspin(sec)	Any	
SpinDecant	Any	
PROG	Any (1-5)	Any numbered (1-5) program

8.2.4 Sample suspension with agitation process

For this sample, the process would be started by pressing the START WASH button.



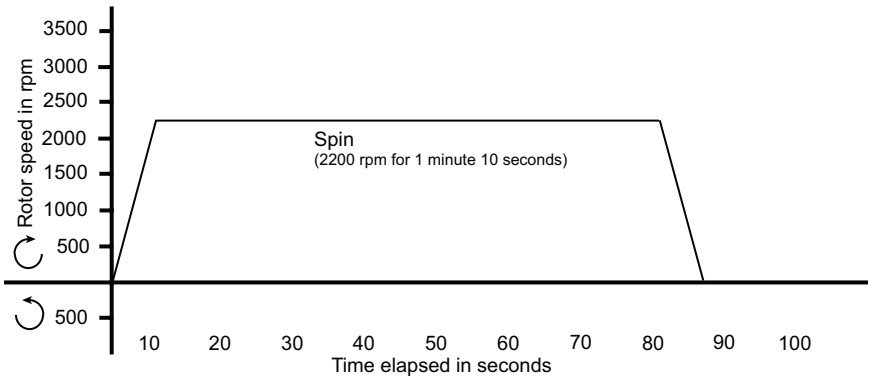
Sample suspension with agitation process

Global parameter settings (suspension with agitation process example)		
Global parameter	**Value**	**Explanation**
VOLUME ADJUST XX	Any	Value depends on the calibration
ROTOR: XX PLACE	Any	Value depends on the rotor being used.
Decant (rpm)	Any	This parameter is ignored for processes that are started with the START WASH button, but do not have a Fill step.
Shakings or ShakeT(min)	Any	This parameter is ignored for processes that have no wash cycles.
Susp.Agit.	8	Enable the suspension-agitation step and agitate for 8 cycles.
D.SpinDown(s)	Any	► Set to 0 to disable the Drop spin-down step for all programs. ► Set to a value greater than 0 to disable the Drop Spin-down step for this program only.
SuspensionM.	YES	Show the SalSusp/ml parameter in the program parameter menu.
Agit.SpinM.	Any	These parameters are ignored for processes started using the START WASH button.
SpinDecantM.	Any	
SOUND/BELL	Any	This parameter does not affect processes

Program parameter settings (suspension with agitation process example)		
Program parameter	**Value**	**Explanation**
#Cyc/wash	0	Do not run any wash cycles prior to the Suspension step.
SalWash/ml	0.0	Disable the Fill step.
Wash(rpm)	Any	This parameter is ignored if there are no wash cycles.
Twash(min)	0	Disable the Spin step prior to the Suspension step.
Twash(sec)	0	
DSpinDown	OFF	If this parameter appears, set it to OFF to disable the Drop spin-down step.
SalSusp/ml	Any	Use the appropriate suspension volume for the tube size that you are using.
Agit.Spin	Any	These parameters are ignored for processes started using the START WASH button.
Spin(rpm)	Any	
Tspin(min)	Any	
Tspin(sec)	Any	
SpinDecant	Any	
PROG	Any (1-5)	Any numbered (1-5) program

8.2.5 Sample spinning-only process

For this sample, the process would be started by pressing the SPIN button.



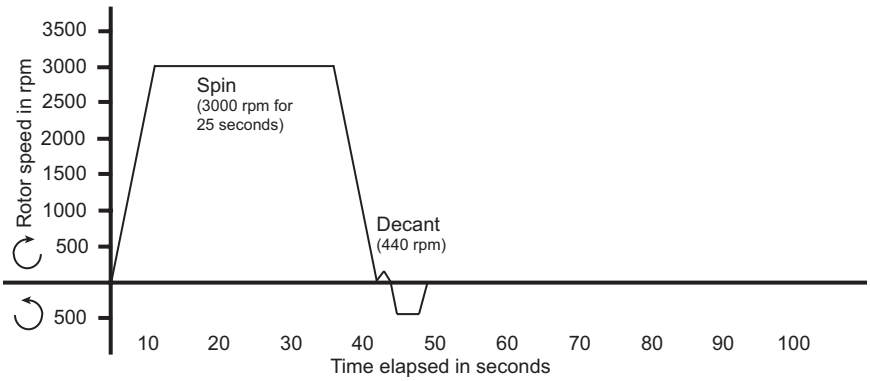
Sample spinning-only process

Global parameter settings (spinning-only process example)		
Global parameter	**Value**	**Explanation**
VOLUME ADJUST XX	Any	Value depends on the calibration
ROTOR: XX PLACE	Any	Value depends on the rotor being used.
Decant (rpm)	Any	These parameters are ignored for the Spin program.
Shakings or ShakeT(min)	Any	
Susp.Agit.	Any	
D.SpinDown(s)	Any	
SuspensionM.	Any	
Agit.SpinM.	Any	
SpinDecantM.	Any	
SOUND/BELL	Any	This parameter does not affect processes

Program parameter settings (spinning-only process example)		
Program parameter	**Value**	**Explanation**
#Cyc/wash	N/A	These parameters do not appear in the program menu for the Spin program.
SalWash/ml		
Wash(rpm)		
Twash(min)		
Twash(sec)		
DSpinDown		
SalSusp/ml		
Agit.Spin		
Spin(rpm)	2200	During the Spin step, spin the rotor at 2200 r/min
Tspin(min)	1	Run the Spin step for 1 minute and 10 seconds
Tspin(sec)	10	
SpinDecant	N/A	This parameter does not appear in the program menu for the Spin program.
PROG	S	Store program as Program S (Spin)

8.2.6 Sample spinning with decanting process

For this sample, the process would be started by pressing the SPIN button.



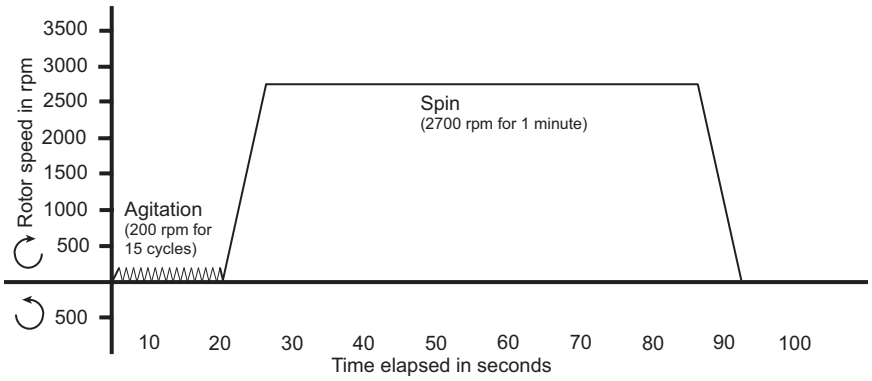
Sample spinning with decanting process

Global parameter settings (spinning with decanting process example)		
Global parameter	**Value**	**Explanation**
VOLUME ADJUST XX	Any	Value depends on the calibration
ROTOR: XX PLACE	Any	Value depends on the rotor being used.
Decant (rpm)	440	Decant at 440 r/min.
Shakings or ShakeT(min)	Any	This parameter is ignored for processes that are started by pressing the SPIN button but have no Agitation step.
Susp.Agit.	Any	These parameters are ignored for processes that are started by pressing the SPIN button.
D.SpinDown(s)	Any	
SuspensionM.	Any	
Agit.SpinM.	Any	► Set to NO to disable the Agitation step that can precede the Spin step for all programs. ► Set to YES to disable the Agitation step that can precede the Spin step for this program only.
SpinDecantM.	YES	Show the SpinDecant parameter in the program menu.
SOUND/BELL	Any	This parameter does not affect processes

Program parameter settings (spinning with decanting process example)		
Program parameter	**Value**	**Explanation**
#Cyc/wash	N/A	These parameters are ignored for processes that are started by pressing the SPIN button.
SalWash/ml		
Wash(rpm)		
Twash(min)		
Twash(sec)		
DSpinDown		
SalSusp/ml		
Agit.Spin	OFF	If this parameter appears, set it to OFF to disable the Agitation step that can precede the Spin step.
Spin(rpm)	3000	During the Spin step, spin the rotor at 3000 r/min
Tspin(min)	0	Run the Spin step for 0 minutes and 25 seconds
Tspin(sec)	25	
SpinDecant	ON	Run the Decant step.
PROG	Any (1-5)	Any numbered (1-5) program

8.2.7 Sample spinning after agitation process

For this sample, the process would be started by pressing the SPIN button.



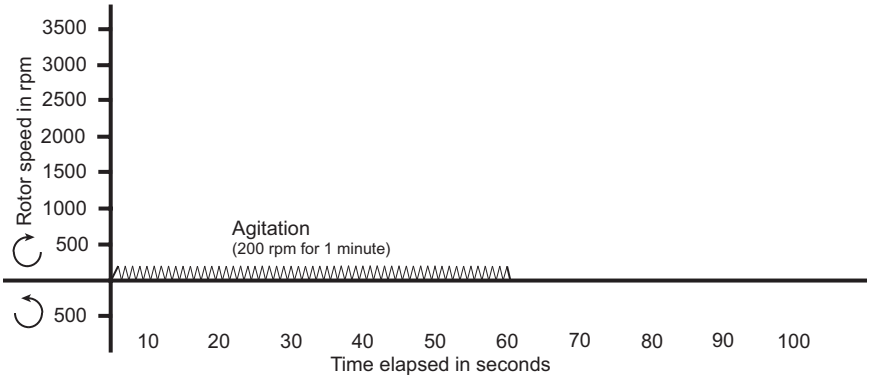
Sample spinning after agitation process

Global parameter settings (spinning after agitation process example)		
Global parameter	**Value**	**Explanation**
VOLUME ADJUST XX	Any	Value depends on the calibration
ROTOR: XX PLACE	Any	Value depends on the rotor being used.
Decant (rpm)	440	This parameter is ignored because there is no Decant step.
Shakings or ShakeT(min)	15 Shakings	Before spinning, agitate for 15 cycles.
Susp.Agit.	Any	These parameters are ignored for processes that are started by pressing the SPIN button.
D.SpinDown(s)	Any	
SuspensionM.	Any	
Agit.SpinM.	YES	Show the Agit.Spin parameter in the program parameter menu.
SpinDecantM.	Any	► Set to NO to disable the Decant step that can follow the Spin step for all programs. ► Set to YES to disable the Decant step that can follow the Spin step for this program only.
SOUND/BELL	Any	This parameter does not affect processes

Program parameter settings (spinning after agitation process example)		
Program parameter	**Value**	**Explanation**
#Cyc/wash	N/A	These parameters are ignored for processes that are started by pressing the SPIN button.
SalWash/ml		
Wash(rpm)		
Twash(min)		
Twash(sec)		
DSpinDown		
SalSusp/ml		
Agit.Spin	ON	Enable the Agitation step that can precede the Spin step
Spin(rpm)	2700	During the Spin step, spin the rotor at 2700 r/min
Tspin(min)	1	Run the Spin step for 1 minute and 0 seconds
Tspin(sec)	0	
SpinDecant	OFF	If this parameter appears, set it to OFF to disable the Decant step that can follow the Spin step.
PROG	Any (1-5)	Any numbered (1-5) program

8.2.8 Sample agitation-only processes

The programming for an agitation-only process differs depending on how the program will be started.



Sample agitation-only process

8.2.8.1 Sample agitation-only process started with the START WASH button

For this sample, the process would be started by pressing the START WASH button.

Global parameter settings (agitation-only process started with START WASH example)		
Global parameter	**Value**	**Explanation**
VOLUME ADJUST XX	Any	Value depends on the calibration
ROTOR: XX PLACE	Any	Value depends on the rotor being used.
Decant (rpm)	440	This parameter is ignored because there is no Decant step.
Shakings or ShakeT(min)	1 minute	Agitate for 1 minute.
Susp.Agit.	Any	This parameter is ignored because this process does not have a Suspension step.
D.SpinDown(s)	Any	► Set to 0 to disable the Drop spin-down step for all programs. ► Set to a value greater than 0 to disable the Drop Spin-down step for this program only.
SuspensionM.	Any	► Set to NO to disable the Suspension step for all programs. ► Set to YES to disable the Suspension step for this program only.
Agit.SpinM.	Any	These parameters are ignored for processes started using the START WASH button.
SpinDecantM.	Any	
SOUND/BELL	Any	This parameter does not affect processes

Program parameter settings (agitation-only process started with START WASH example)		
Program parameter	**Value**	**Explanation**
#Cyc/wash	2	Must be set to 2 for this process.
SalWash/ml	0.0	Disable the Fill step.
Wash(rpm)	Any	This parameter is ignored if there is no Fill step.
Twash(min)	0	Disable the Spin step.
Twash(sec)	0	
DSpinDown	OFF	If this parameter appears, set it to OFF to disable the Drop spin-down step.
SalSusp/ml	0.0	If this parameter appears, set it to 0.0 to disable the Suspension step.
Agit.Spin	Any	These parameters are ignored for processes started using the START WASH button.
Spin(rpm)	Any	
Tspin(min)	Any	
Tspin(sec)	Any	
SpinDecant	Any	
PROG	Any (1-5)	Any numbered (1-5) program

8.2.8.2 Sample agitation-only process started with the SPIN button

For this sample, the process would be started by pressing the SPIN button.

Global parameter settings (agitation-only process started with SPIN button example)		
Global parameter	**Value**	**Explanation**
VOLUME ADJUST XX	Any	Value depends on the calibration
ROTOR: XX PLACE	Any	Value depends on the rotor being used.
Decant (rpm)	440	This parameter is ignored because there is no Decant step.
Shakings or ShakeT(min)	1 minute	Agitate for 1 minute.
Susp.Agit.	Any	These parameters are ignored for processes that are started by pressing the SPIN button.
D.SpinDown(s)	Any	
SuspensionM.	Any	
Agit.SpinM.	YES	Show the Agit.Spin parameter in the program parameter menu.
SpinDecantM.	Any	► Set to NO to disable the Decant step that can follow the Spin step for all programs. ► Set to YES to disable the Decant step that can follow the Spin step for this program only.
SOUND/BELL	Any	This parameter does not affect processes

Program parameter settings (agitation-only process started with SPIN button example)		
Program parameter	**Value**	**Explanation**
#Cyc/wash	N/A	These parameters are ignored for processes that are started by pressing the SPIN button.
SalWash/ml		
Wash(rpm)		
Twash(min)		
Twash(sec)		
DSpinDown		
SalSusp/ml		
Agit.Spin	ON	Enable the Agitation step.
Spin(rpm)	Any	This parameter is ignored because there is no Spin step.
Tspin(min)	0	Disable the Spin step.
Tspin(sec)	0	
SpinDecant	OFF	If this parameter appears, set it to OFF to disable the Decant step that can follow the Spin step.
PROG	Any (1-5)	Any numbered (1-5) program

Warranty

USA and Canada

For technical service needs, please contact Helmer at 800-743-5637 or www.helmerinc.com. Be sure to have the model and serial number available.

Rapid Resolution

When a warranty issue arises it is our desire to respond quickly and appropriately. The service department at Helmer is there for you. Helmer will oversee the handling of your warranty service from start to finish. Therefore, Helmer must give advance authorization for all service calls and/or parts needs relating to a warranty issue. Any repeat service calls must also be authorized as well. This allows for proper diagnosis and action. Helmer will not be responsible for charges incurred for service calls made by third parties prior to authorization from Helmer. Helmer retains the right to replace any product in lieu of servicing it in the field.

Parts

For a period of two (2) years, Helmer will supply at no charge, including freight, any part that fails due to defects in material or workmanship under normal use, with the exception of expendable items. Expendable items include specimen tubes, saline supply tubing, drain tubing, internal saline supply tubing, pump tubing, and saline supply fittings.

Defective parts must be returned, prepaid, with previous return authorization. Inspection of defective parts by Helmer will be final in determining warranty status. Warranty procedures must be followed in all events.

Labor

For a period of one (1) year Helmer will cover repair labor costs, provided the product is returned to Helmer for warranty service. Alternatively, your service staff may work with a Helmer technician to make repairs on site. Labor costs for repairs performed at a location other than Helmer, or for repairs made without the assistance of a Helmer technician, will be the responsibility of the end user.

Helmer will not be responsible for charges incurred for service calls made by third parties prior to authorization from Helmer. Helmer retains the right to replace any product in lieu of servicing it in the field.

Additional warranty information

The time periods set forth above begin two weeks after the original date of shipment from Helmer. Warranty procedures set forth above must be followed in all events.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY.

THE LIABILITY, IF ANY, OF HELMER FOR DIRECT DAMAGES WHETHER ARISING FROM A BREACH OF ANY SALES AGREEMENT, BREACH OF WARRANTY, NEGLIGENCE, OR INDEMNITY, STRICT LIABILITY OR OTHER TORT, OR OTHERWISE WITH RESPECT TO THE GOODS OR ANY SERVICES IS LIMITED TO AN AMOUNT NOT TO EXCEED THE PRICE OF THE PARTICULAR GOODS OR SERVICES GIVING RISE TO THE LIABILITY. IN NO EVENT SHALL HELMER BE LIABLE FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES, INCLUDING WITHOUT LIMITATION DAMAGES RELATED TO LOST REVENUES OR PROFITS, OR LOSS OF PRODUCTS.

This warranty does not cover damages caused in transit, during installation by accident, misuse, fire, flood, or acts of God. Further, this warranty will not be valid if Helmer determines that the failure was caused by a lack of performing recommended equipment maintenance (per Helmer manual) or by using the product in a manner other than for its intended use. Installation and calibration are not covered under this warranty agreement.

Outside of USA and Canada

Consult your local distributor for warranty information.

HELMER, INC. 14395 BERGEN BLVD., NOBLESVILLE, IN 46060 USA
PHONE (317) 773-9073 FAX (317) 773-9082
USA and CANADA (800) 743-5637
www.helmerinc.com